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HONORABLE MENTION.

NAVAL POWER.

By REAR-ADMIRAL BRADLEY A. FISKE, U. S. Navy.

Motto: *"Sleepers, Wake."*

NOTE.—The enormous increase in the power of navies that has taken place within the past ten years, with the corresponding relative decrease in the power of armies, constitute a phenomenon whose causes and whose characteristics are only vaguely understood. To many it seems based on some mistake, and to it the phrase "craze for naval armaments" is frequently applied. The present paper is the outcome of an effort by the writer to discern what fundamental property has enabled navies to increase so tremendously in their power, and why the nations spend so much money utilizing it; and also to find some simple truths, to help us develop naval power still further.

Mahan proved that sea power has exercised a determining influence on history. He proved that sea power has been necessary for commercial success in peace and military success in war. He proved that, while many wars have culminated with the victory of some army, the victory of some navy had been the previous essential. He proved that the immediate cause of success had often resulted inevitably from another cause, less apparent because more profound; that the operations of the navy had previously brought affairs up to the "mate in four moves," and that the final victory of the army was the resulting "checkmate."

Before Mahan proved his doctrine, it was felt in a general way that sea power was necessary to the prosperity and security of a nation. Mahan was not the first to have this idea, for it had been in the minds of some men, and in the policy of one nation, for more than a century. Neither was Mahan the first to put forth the idea in writing; but he was the first to make an absolute demonstration of the truth. Newton was not the first man to know, or to say, that things near the earth tend to fall to the earth; but he was the first to formulate and prove the doctrine of universal gravitation. In the same way, all through history, we find that a few master minds have been able to group what had theretofore seemed unrelated phenomena, and deduce from them certain laws. In this way they substituted reasoning for speculation, fact for fancy, wisdom for opportunism, and became the guides of the human race.

The effect of the acceptance of Mahan's doctrine was felt at once. Realizing that the influence of sea power was a fact, comprehending Great Britain's secret, after Mahan had disclosed it, certain other great nations of the world, especially Germany, immediately started with confidence and vigor upon the increase of their own sea power, and pushed it to a degree before unparalleled; with a result that to-day must be amazing to the man who, more than any other, is responsible for it.

Since the words "sea power," or their translation, is a recognized phrase the world over, and since the power of sea power is greater than ever before, and is still increasing, it may be profitable to consider sea power as an entity, and to inquire what are its leading characteristics, and in what it mainly consists.

There is no trouble in defining what the sea is, but there is a good deal of trouble in defining what power is If we look in a dictionary, we shall find a good many definitions of power; so many as to show that there are many different kinds of power, and that when we read of "power," it is necessary to know what kind of power is meant. Clearly "sea power" means power on the sea. But what kind of power? There are two large classes into which power may be divided, passive and active. Certainly we seem justified, at the start, in declaring that the power meant by Mahan was not passive, but active. Should this be granted, we cannot be far from right if we go a step further, and declare that sea power means ability to do something on the sea.

If we ask what the something is that sea power has ability to do, we at once perceive that sea power may be divided into two parts, commercial power and naval power.

The power exerted by commercial sea power is clearly that exerted by the merchant service, and is mainly the power of acquiring money. It is true that the merchant service has the power of rendering certain services in war, especially the power of providing auxiliary vessels, and of furnishing men accustomed to the sea; but as time goes on the power contributable by the merchant service must steadily decrease, because of the relatively increasing power of the naval service, and the rapidly increasing difference between the characteristics of ships and men suitable for the merchant service and those suitable for the naval service.

But even in the past, while the importance of the merchant service was considerable in the ways just outlined, it may perhaps be questioned whether it formed an element of sea *power*, in the sense in which Mahan discussed sea power. The power of every country depends on all the sources of its wealth; on its agriculture, on its manufacturing activities, and even more directly on the money derived from imports. But these sources of wealth, and all sources of wealth, including the merchant service, can hardly be said to be elements of power themselves, but rather to be elements for whose protection power is required.

In fact, apart from its usefulness in furnishing auxiliaries, it seems certain that the merchant service has been an element of *weakness*. The need for navies arose from the weakness of merchant ships and the corresponding necessity for assuring them safe voyages and proper treatment even in time of peace; while in time of war they have always been an anxious care, and have needed and received the protection of fighting ships, that have been taken away from the fleet to act as convoys.

If commercial sea power was not the power meant by Mahan, then he must have meant naval power. And if one reads the pages of history with patient discrimination, the conviction must grow on him that what really constituted the sea power which had so great an influence on history, was *naval* power; not the power of simply ships upon the sea, but the power of a navy composed of ships able to fight, manned by men trained to fight, under the command of captains skilled to fight, and led by admirals

determined to fight. Trafalgar was not won by the merchant service; nor Mobile, Manila or Tsushima.

CHARACTERISTICS OF NAVAL POWER.

If sea power be essentially naval power, it may be interesting to inquire: In what does naval power consist and what are its principal characteristics?

If one looks at a fleet of warships on the sea, he will be impressed consciously or unconsciously, with the idea of power. If he is impressed consciously, he will see that the fleet represents power in the broadest sense; power active, and power passive; power to do, and power to endure; power to exert force, and power to resist it.

If he goes further and analyzes the reasons for this impression of power, he will see that it is not merely a mental suggestion, but a realization of the actual existence of tremendous mechanical power, under complete direction and control.

In mechanics we get a definition of power, which, like all definitions in mechanics, is clear, definite and correct. In mechanics, power is the rate at which mechanical work is performed. It is ability to do something in a certain definite time.

Now this definition gives us a clear idea of the way in which a navy directly represents power, because the power which a navy exerts is, primarily, mechanical; and any other power which it exerts is secondary, and derived wholly from its mechanical power. The power of a gun is due wholly to the mechanical energy of its projectile, which enables it to penetrate a resisting body; and the power of a moving ship is due wholly to the mechanical energy of the burning coal within its furnaces.

It may be objected that it is not reasonable to consider a ship's energy of motion as an element of naval power, in the mechanical sense in which we have been using the word "power," for the reason that it could be exerted only by the use of her ram, an infrequent use. To this it may be answered that energy is energy, no matter to what purpose it is applied; that a given projectile going at a given speed has a certain energy, whether it strikes its target or misses it; and that a battleship going at a certain speed must necessarily have a certain definite energy, no matter whether it is devoted to ramming another ship or to carrying itself and its contents from one place to another.

Besides the mechanical power exertable by the mere motion of the ship, and often superior to it, there is the power of her guns and torpedoes.

Perhaps the most important single invention ever made was the invention of gunpowder. Why? Because it put into the hands of man a tremendous force, compressed into a very small volume, which he could use instantaneously, or refrain from using at his will. Its first use was in war; and in war has been its main employment ever since. War gives the best field for the activity of gunpowder, because in war we always wish to exert a great force at a definite point at a given instant; usually in order to *penetrate* the bodies of men, or some defensive work that protects them. Gunpowder is the principal agent used in war up to the present date. It is used by both armies and navies; but navies give the larger field for its employment.

Of course this does not mean that it would be impossible to send a lot of powder to a fort, more than a fleet could carry, and fire it; but it does mean that history shows that forts have rarely been called upon to fire much powder, and that their lives have been peaceful. And all the indications of the future seem to show that, while the great preventive value of forts will continue to be recognized, yet nevertheless forts will actually fire powder even less in the future than in the past, for the reason that they fulfil their purpose so perfectly that ships will keep away from them.

Leaving forts out of consideration for a moment, and searching for something else in which to use gunpowder on a large scale, we come to siege pieces, field pieces, and muskets. Disregarding siege pieces and field pieces, because there are so few of them, and they not very big, we come to muskets.

Now the musket is an extremely formidable weapon, and has, perhaps, been the greatest single contributor to the victory of civilization over barbarism, and order over anarchy, that has ever existed up to the present time. But the enormous advances in engineering, including ordnance, during the last fifty years, have reduced enormously the relative value of the musket. Remembering that energy, or the ability to do work, is expressed by the formula: $E = \frac{1}{2}MV^2$, remembering that the projectile of the modern 12-inch gun starts at about 2900 f. s. velocity and weighs 867 pounds, while the bullet of a musket weighs only 150 grains and starts with a velocity of 2700 feet per second, we

see that the energy of the 12-inch projectile is about 47,000 times that of the bullet on leaving the muzzle. But after the bullet has gone, say 5000 yards, its energy has fallen to zero, while the energy of the 12-inch projectile is nearly the same as when it started.

While it would be truthful, therefore, to say that the energy of the 12-inch gun within 5000 yards is greater than that of 47,000 muskets, it would also be truthful to say that outside of 5000 yards, millions of muskets would not be equal to one 12-inch gun.

Not only is the 12-inch gun a weapon incomparably great, compared with the musket, but when placed in a naval ship, it possesses a portability which, while not an attribute of the gun itself, is an attribute of the combination of gun and ship, and a distinct attribute of naval power. A 12-inch gun placed in a fort may be just as good as a like gun placed in a ship, but it has no power to exert its power usefully unless some enemy comes where the gun can hit it. And when one searches the annals of history for the records of whatever fighting forts have done, he finds that they have been able to do very little. But a 12-inch gun placed in a man-of-war can be taken where it is needed, and recent history shows that naval 12-inch guns, modern though they are, have already done effective work in war.

Not only are 12-inch guns powerful and portable, but modern mechanical science has succeeded in so placing them in our ships that they can be handled with a precision, quickness, and delicacy that have no superior in any other branch of engineering. While granting the difficulty of an exact comparison, the writer feels no hesitation in affirming that the greatest triumph of the engineering art in handling heavy masses is to be found in the turret of a battleship. Here again, and even inside of 5000 yards, we find the superiority of the great gun over the musket, as evidenced by its accuracy in use. No soldier can fire his musket, even on a steady platform, himself and target stationary, and the range known perfectly, as accurately as a gun-pointer can fire a 12-inch gun; and if gun and target be moving, and the wind be blowing, and the range only approximately known, as is always the case in practice, the advantage of the big gun in accuracy becomes incomparable.

But it is not only the big projectile itself which has energy,

for this projectile carries a large charge of high explosive, which exploding some miles away from where it started, exerts a power inherent in itself, that was exhibited with frightful effect against the Russian ships at the battle of Tsushima.

This brings us to the auto-torpedo, a weapon recently perfected; in fact not perfected yet. Here is another power that science has put into the hands of naval men in addition to those she had already put there. The auto-torpedo, launched in security from below the waterline of the battleship, or from a destroyer or submarine, can be directed in a straight line over a distance, and with a speed, that are constantly increasing with the improvement of the weapon. At the present moment, a speed of 27 knots over 4000 yards can be depended on, with a probability that on striking an enemy's ship below the waterline it will disable that ship, if not sink her. There seems no doubt that, in a very few years, the systematic experiments now being applied to the development of the torpedo will result in a weapon which can hardly be called inferior to the 12-inch gun, and will probably surpass it.

Controllability.—If one watches a fleet of ships moving on the sea, he gets an impression of tremendous power. But if he watches Niagara, or a thunder storm, he also gets an impression of tremendous power. But the tremendous power of Niagara, or the thunder storm, is a power that belongs to Niagara or the thunder storm, and not to man. Man cannot control the power of Niagara or the thunder storm; but he can control the power of a fleet.

Speaking then from the standpoint of the human being, one may say that the fleet has the element of controllability, while Niagara and the thunder storm have not. One man can make the fleet go faster or slower or stop; he can increase its power of motion or decrease it at his will; he can reduce it to zero. He cannot do so with the forces of nature.

Directability.—Not only can one man control the power of the fleet, he can also direct it; that is, can turn it to the right or the left as much as he wishes. But one man cannot change the direction of motion of Niagara or the lightning bolt.

Power, Controllability and Directability.—We may say then that a fleet combines the three elements of mechanical power, controllability, and directability.

The Unit of Military Power.—This is an enormous power that has come into the hands of the naval nations; but it has come so newly that we do not appreciate it yet. One reason why we do not and cannot appreciate it correctly is that no units have been established by which to measure it.

To supply this deficiency, the writer begs leave to point out that, since the military power of every nation has until recently been its army, of which the unit has been the soldier, whose power has rested wholly in his musket, the musket has actually been the unit of military power. In all history, the statement of the number of men in each army has been put forward by historians as giving the most accurate idea of their fighting value; and in modern times, nearly all of these men have been armed with muskets only.

It has been said already in this paper that the main reason why the invention of gunpowder was so important was that it put into the hands of man a tremendous mechanical power compressed into a very small space, which man could use or not use at his will. This idea may be expressed by saying that gunpowder combines power and great controllability. But it was soon discovered that this gunpowder, put into a tube with a bullet in front of it, could discharge that bullet in any given direction. A musket was the result, and it combined the three requisites of a weapon, mechanical power, controllability and directability.

While the loaded gun is perhaps the clearest example of the combination of the three factors we are speaking of, the moving ship supplies the next best example. It has very much greater mechanical power; and in proportion to its mass, almost as much controllability and directability.

The control and direction of a moving ship is a very wonderful thing; but the very ease with which they are performed makes us overlook the magnitude of the achievement and the perfection of the means employed. It may seem absurd to speak of one man controlling and directing a great ship, but that is pretty nearly what happens sometimes; for sometimes the man at the wheel is the only man on board doing anything at all; and he is absolutely directing the entire ship. At such times (doubtless they are rare and short) the man at the wheel on board, say the *Mauretania*, is directing unassisted by any human being, a mass of 45,000 tons, which is going through the water

at a speed of 26.5 knots or 30 miles an hour, nearly as fast as the average passenger train. In fact, it would be very easy to arrange on board the *Mauretania* that this should actually happen; that everybody should take a rest for a few minutes, coal passers, water tenders, oilers, engineers and the people on deck. And while such an act might have no particular value, *per se,* and prove nothing important, yet, nevertheless a brief reflection on the possibility may be interesting, and lead us to see clearly into the essential nature of what is here called "directability." The man at the wheel on board the *Mauretania,* so long as the fires burn and the oil continues to lubricate the engines, has a power in his hands that is almost inconceivable. The ship that he is handling weighs as much as the standing army of Germany.

Now can anybody imagine the entire standing army of Germany being carried along at thirty miles an hour and turned almost instantly to the right or left by one man? The standing army of Germany is supposed to be the most directable organization in the world; but could the emperor of Germany move that army at a speed of thirty miles an hour and turn it as a whole (not its separate units) through ninety degrees in three minutes?

The *Mauretania,* being a merchant ship and not fully representing naval power, perhaps it might be better to take, say the *Arkansas.* The weight would be more than half that of the *Mauretania,* that is it would be more than the weight of the British standing army; and the usual speed would be about, say, 15 knots. But in addition to all the power of the ship, as a ship, she will have the power of all the guns, twelve 12-inch guns, and twenty-one 5-inch guns, whose projectiles, not including the torpedoes, will have an energy at the muzzle greater than the energy of all the muskets in the German standing army. Now anyone who has seen a battleship at battle practice knows that all the various tremendous forces are under excellent direction and control. And while it cannot be strictly said that they are absolutely under the direction and control of the captain, while it must be admitted that no one man can really direct so many rapidly moving things, yet it is certainly well within the truth to say that the ship and all it contains are very much more under the control of her captain than the German standing army is under the control of the Kaiser. The captain, acting through the helmsman, chief engineer, ordnance officer and executive officer, can

get very excellent information as to what is going on, and can have his orders carried out with very little delay; but the mere space occupied by an army of 600,000 men, and the unavoidable dispersion of its units prevent any such exact control.

In other words the captain of the *Arkansas* will wield a weapon more intrinsically powerful than the German standing army: and his control of it will be more absolute than is the Kaiser's control of that army.

Mechanism vs. Men.—Now what is the essential reason for the efficient direction exercised by the helmsman of the *Arkansas,* and the relative impotency of generals? It is not that the helmsman acts through the medium of mechanism, while the generals act through the medium of men? A ship is not only made of rigid metal, but all her parts are fastened together with the utmost rigidity: while the parts of an army are men, who are held together by no means whatever except that which discipline gives, and the men themselves are far from rigid. In the nature of things it is impossible that an army should be directed as perfectly as a ship. The rudder of a ship is a mechanical appliance that can be depended upon to control the direction of the ship absolutely, while an army has no such a thing as a rudder, or anything to take its place. Again, the rudder is only a few hundred feet from the helmsman, and the communication between them, including the steering engine itself, is a strong reliable mechanism, that has no counterpart in the army.

The control of the main engines of a ship is almost as absolute as the control of the rudder; and the main engines are not only much more powerful than the legs of soldiers, but they act together in much greater harmony.

Inherent Power of a Battleship.—Possibly the declaration may be accepted now that a battleship of 26,000 tons such as the navies are building now, with, say, twelve 12-inch guns is a greater example of power, under the absolute direction and control than anything else existing; and that the main reason is the concentration of a tremendous amount of mechanical energy in a very small space, all made available by certain properties of water. Nothing like a ship can be made to run on shore; but if an automobile could be constructed, carrying twelve 12-inch guns, twenty-one 5-inch guns and four torpedo tubes, of the size of the *Arkansas,* and with her armor, able to run over the land in any

direction at 20 knots, propelled by engines of twenty thousand horse power, it could whip an army of a million men just as quickly as it could get hold of its component parts. Such a machine could start at one end of an army and go through to the other like a mowing machine through a field of wheat; and knock down all the buildings in New York afterwards, smash all the cars, break down all the bridges and sink all the shipping.

Inherent Power of a Fleet.—An idea of the power exertable by a fleet of modern ships may be derived from the following comparison.

When Sherman made his wonderful march to the sea from Atlanta to Savannah, he made a march whose details are historically known, which was unopposed, which was over a flat country, in good weather, and without the aid of railroad trains. It was a march, pure and simple; and inasmuch as men are the same now as they were then, it gives excellent data of the way in which purely military or army power can move from one place to another, *while still preserving its character and exercising its functions.* Similarly, when Admiral Schroeder, in November, 1910, went from the east coast of the United States to the English Channel, his march was unopposed, its details are known, and it gave an excellent illustration of how naval power can move from one place to another, *while still preserving its character and exercising its functions.*

Now General Sherman was a man of world-wide fame, and so were some of his generals, and Sherman's fame will last for centuries. Compared with Sherman, Admiral Schroeder was obscure; and compared with Sherman's officers, Admiral Schroeder's were obscure. Sherman's soldiers, privates and all, were made glorious for the rest of their lives by having been in Sherman's march to the sea, while Admiral Schroeder's sailors achieved no glory at all. So, the next paragraph is not intended to detract in the slightest from Sherman and his army, but simply to point out the change in conditions that mechanical progress has brought about.

The statement of comparison is simply that when General Sherman marched from Atlanta to the sea, his army composed 62,000 men, and it took him twenty-five days to go about 230 land miles or 200 sea miles; and when Admiral Schroeder went from our coast to Europe he had sixteen ships, and he made the

trip of more than 3000 sea miles in less than fourteen days. Disregarding twenty-eight 5-inch guns, 252 3-inch guns, and a lot of smaller guns, and disregarding all the torpedoes, Admiral Schroeder took eighty-four 12-inch guns, ninety-six 8-inch guns, eighty-eight 7-inch guns and forty-eight 6-inch guns, *all mounted and available;* which, assuming the power of the modern musket as a unit, equalled more than five million modern muskets.

Such an enormous transfer of absolute, definite, available power would be impossible on land, simply because no means has been devised to accomplish it. Such a transfer on land would be the transfer of ninety times as many soldiers as Sherman had (even supposing they had modern muskets) over fifteen times the distance and at thirty times the speed; and as the work done in going from one place to another varies practically as the square of the speed, a transfer on land equivalent in magnitude and speed to Schroeder's would be a performance $90 \times 15 \times 30^2 = 1{,}215{,}000$ times as great as Sherman's.

This may seeem absurd, and perhaps it is; but why? The comparison is not between the qualities of the men or between the results achieved. Great results often are brought about by very small forces, as when some state of equilibrium is disturbed, and vice versa. The comparison attempted is simply between the *power* of a certain army and the *power* of a certain fleet. And while it is true that, for some purposes, such as overcoming small resistance, great power may not be as efficacious as feeble power, or even gentleness, yet, nevertheless, it must be clear that, for the overcoming of *great* resistance quickly great power must be applied.

The existence of a certain power is quite independent of the desirability of using it. The existence of the power is all the writer wishes to insist upon at present; the question of its employment will be considered later.

Not only is the power of a fleet immeasurably greater than that of an army, but it must always be so, from the very nature of things. The speed of an army, *while exercising the functions of an army,* and the power of a musket, while exercising its functions as a weapon of one soldier, cannot change much from what they were when Sherman went marching through Georgia. But, thanks to mechanical science, there is no limit in sight to the power to which a fleet may attain.

The power of a navy is of recent growth, but it is increasing and is going to continue to increase. Every advance of civilization will advance the navy. Every new discovery and invention will directly or indirectly serve it. The navy will become the repository of the profoundest thought and the sharpest intellectual endeavor of the age. The navy, more than any other thing, will give opportunity for mechanism, and to mechanism. Far beyond any possible imagination of today, it will become the highest expression of the Genius of Mechanism, and the embodiment of its spirit.

The Necessity for Naval Power.

The amount of money now being spent by the United States on its navy is so great that the expenditure can be justified only on the basis that great naval power is essential to the country.

Is it essential and if so, why?

Primary Use for a Navy.—To answer this wisely, it may be well to remind ourselves that the principal object of all the vocations of men is directly or indirectly the acquiring of money. Money, of course, is not wealth; but it is a thing which can be so easily exchanged for wealth, that it is the thing which most people work for. Of course, at bottom, the most important work is the getting of food out of the ground; but inasmuch as people like to congregate together in cities, the things taken out of the ground in one place must be transported to other places; and inasmuch as every person wants every kind of thing that he can get, a tremendous system of interchange, through the medium of money, has been brought about, which is called "trade." For the protection of property and life, and in order that trade may exist at all, an enormous amount of human machinery is employed which we call "government." This government is based on innumerable laws, but these laws would be of no avail unless they were carried out; and every nation in the world has found that employment of a great deal of force is necessary, in order that they shall be carried out. This force is mainly exercised by the police of the cities; but many instances have occurred in the history of every country where the authority of the police has had to be supported by the army of the national government. There is no nation in the world, and there never has been one, in which the necessary laws for the protection of the lives, property and

trade of the people that has not depended ultimately on the army; and the reason why the army could support the laws was simply the fact that the army had the power to inflict suffering and death.

As long as a country carried on trade within its own borders exclusively, as long as it lived within itself, so long as its people did not go to countries oversea, a navy was not necessary; and to countries like Switzerland it is not necessary now. But when a country is not contented to live within its own borders, then a navy becomes essential, for the same reason that an army does.

Now the desire of the people of a country to extend their trade beyond the seas seems in some ways not always a conscious desire, not a deliberate intent, but to be an effort of self protection, or largely an effort of expansion; for getting room or employment. As the people of a country become civilized, labor-saving devices multiply; and where one man by means of a machine can do the work of a hundred, ninety-nine men may be thrown out of employment; out of a hundred men who till the soil, only one man may be selected and ninety-nine men have to seek other employment. Where shall it be gotten? Evidently it must be gotten in some employment which may be called "artificial," such as working in a shop of some kind, or doing some manufacturing work. But so long as a people live unto themselves only, each nation can practically make all the machinery needed within its borders, and still not employ all the idle hands; and when the population becomes dense, employment must be sought in making goods to sell beyond the sea. The return comes back, sometimes in money, sometimes in the products of the soil, and the mine, and the manufactures of foreign lands.

In this way every nation becomes like a great business firm. It exports (that is, sells,) certain things, and it imports (that is, buys,) certain things; and if it sells more than it buys it is making money; if it buys more than it sells it is spending money. This is usually expressed by saying that the "balance of trade" is in its favor or against.

In a country like the United States, or any other great nation, the amount of exporting and importing, of buying and selling almost every conceivable article under the sun, is carried on in the millions and millions of dollars; and so perfect has the organization for doing this business become in every great country, that the products of the most distant countries can be bought in

almost every village; and any important event in any country produces a perceptible effect wherever the mail and telegraph go.

The organization for effecting this in every country is so excellent and so wonderful, that it is like a machine.

In fact, it is a machine, and with all the faults of a machine. Now one of the faults of a machine, a fault which increases in importance with the complexity of the machine, is the enormous disturbance which may be produced by a cause seemingly trivial. That such is the case with the machine which the commerce of every great nation comprises, every-day experience confirms. So long as the steamers come and go with scheduled regularity, so long will the money come in at the proper intervals, and be distributed through the various channels; so long will the people live the lives to which they are habituated; so long will order reign.

But suppose the coming and going of all the steamers was suddenly stopped. While it may be true that, in a country like the United States, no foreign trade is really necessary; while it may be true that the people of the United States would be just as happy, though not so rich, if they had no foreign trade,—yet the sudden stoppage of foreign trade would not bring about a condition such as would have existed if we had never had any foreign trade, but would bring about a chaotic condition which cannot fitly be described by a feebler word than "horrible." The whole machinery of every-day life would be disabled. Hundreds of thousands of people would be thrown out of employment, and the whole momentum of the rapidly moving enormous mass of American daily life would receive a violent shock which would strain to its elastic limit every part of the entire machine.

It would take a large book to describe what would ensue from the sudden stoppage of the trade of the United States, or of any large manufacturing nation, with countries over the sea. Such a book would besides be largely imaginative; because in the history of the world such a condition has never yet arisen. Although wars have happened in the past in which there has been a blockade of the coast more or less complete, peace has been declared before the suffering produced has become very acute; and furthermore the conditions of furious trade which now exist in certain countries have never existed before anywhere. Nations have never become so thoroughly habituated to, and dependent upon,

foreign trade as now; so that there are no data upon which to base any actual statement of what would actually happen if our foreign trade were suddenly stopped by a blockade of our principal ports. Disasters would ensue, apart from the actual loss of money, due simply to the sudden change. In a railroad train standing still, or moving at a uniform speed the passengers are comfortable; but if that same train is suddenly brought to rest when going at a high speed, say by collision, the consequences are horrible in the extreme, and the horror is caused *simply by the suddenness of the change*. The same is true all through nature and human nature. Any sudden change in the velocity of any mass has its exact counterpart in any sudden change in the conditions of living of any man or woman, or any sudden change in the conditions under which any organization must carry on its business. The difficulty is not with individuals only, or with the organizations themselves, and does not rest solely on the personal inability of people to accommodate themselves to the losing of certain conveniences or luxeries; but it is a difficulty, possessing the nature of inertia, of instantly meeting new situations and grappling with new problems.

Every organization, no matter how small, is conducted according to some system, and that system is based upon certain more or less permanent conditions, which, if suddenly changed, make the system inapplicable. The larger the organization, and the more complex it is, the more will it be deranged by any change of external conditions, and the longer time will it take to adapt itself to them.

The sudden stoppage of our sea trade including our coasting trade by even a partial blockade of our ports, would change practically all the conditions under which we live. There is hardly a single organization in the country which would not be affected by it. And, as every organization would know that every other organization would be affected, but to a degree which could not possibly be determined, because there would be no precedent, it cannot be an exaggeration to declare that the blockading of our principal ports would, entirely apart from direct loss of money and other commodities, produce a state of confusion, out of which order could not possibly be evolved except by the raising of the blockade.

In addition to the confusion brought about, there would, of

course, be the direct loss of money and non-receipt of imported things; but what would probably be the very worst thing of all would be the numbers of men thrown out of employment by the loss of foreign markets. *So long as a country can keep its people in employment, so long the people will live in comparative order.* But when there are many unemployed men in a country, not only do their families lose the means of subsistence, but the very fact of the men being unemployed leads them into mischief. Should the ports of any great commercial nation be suddenly closed, the greatest danger to the country would not be from the enemy outside, but from the unemployed people inside!

It will be seen, therefore, that the blockading of the principal ports of any commercial country would be a disaster so great that there could not be a greater one except actual invasion. Another disaster might be the total destruction of its fleet by the enemy's fleet; but the only *direct* result of this would be that the people of the country would have fewer ships to support and fewer men to pay. The loss of the fleet and the men would not *per se,* be any loss whatever to the country, but rather a gain. The loss of the fleet, however, would make it possible for the enemy's fleet to blockade our ports later, and thus bring about the horrors of which we have spoken.

While it is true that an absolute blockade of any port might be practically impossible at the present day, while it is true that submarines and torpedo boats might compel blockading ships to keep at such distance from ports that many loopholes of escape would be open to blockade runners, yet it may be pointed out that even a partial blockade, even a blockade that made it risky for vessels to try to break it, would have a very deleterious effect upon the prosperity of the country and of every man, woman and child within it. A blockade like this was that maintained during the greater part of the Civil War by the northern states against the southern states. This blockade, while not perfect, while it was such as to permit many vessels to pass both ways, was nevertheless so effective that it made it impossible for the southern states to be prosperous, or to have any reasonable hope of ever being prosperous. And while it would be an exaggeration to state that the navy itself, unaided by the army, could have brought the South to terms; while it would be an exaggeration to state that all the land battles fought in the Civil War were unnecessary, that

all the bloodshed and all the ruin of harvests and of homesteads were unnecessary, nevertheless it does seem that so long as the navy maintained the blockade which it did maintain, the people of the South would have been prevented from achieving enough prosperity to carry on an independent government; so that their revolt would have failed. The South, not being able to raise the blockade by means of their navy, might have tried to do so by sending an army into the Northern States, to whip the northerners on their own ground; but this would clearly have been impossible.

The sentences above are not written with the intention of minimizing the services rendered by the army in the Civil War, or of detracting from the glory of the gallant officers and men who composed it, or of subtracting one jot or tittle from a grateful appreciation of their hardships and bloodshed; neither does it dare to question the wisdom of the statesmen who directed that the war should be fought mainly by the army. Its sole intention is to point out that, if a meager naval force could produce so great an effect against a country *mainly agricultural,* that a very powerful naval force, blockading effectively the principal ports of a *manufacturing country,* would have an effect so great that it can hardly be estimated.

It is plainly to be seen that the effect of a blockade against a modern country by a modern navy would be incomparably greater now than it was 50 years ago, for two very important reasons. One reason is that the progress of modern engineering has made navies very much more powerful than they were 50 years ago; and the other reason is that the same cause has made countries very much more vulnerable to blockade; because it has made so many millions of people dependent upon manufacturing industries and the export of manufactured things, and forced them to live an artificial life. While the United States, for instance, does not depend for its daily bread on the regular coming of wheat from over the sea, yet millions of its people do depend, though indirectly, upon the money due from the sale of manufactured things coming into the country from over the sea; for with countries as with people, habits are formed both of system and of mode of life, which it is dangerous suddenly to break; so that a country soon becomes as dependent upon outside commerce as a man does upon outside air, and a people suddenly deprived of a vigorous outside

commerce would seem to be smothered almost like a man deprived of outside air.

A rough idea of the possible effect of a blockade of our coast may be gathered from the fact that our exports last year were valued at about 1,800,000,000; which means that goods to this amount were sold for which a return was received, either in money or its equivalent, most of it, ultimately, as wages for labor. Of course no blockade could stop all of this; but it does not seem impossible that it could stop half of it, if our fleet were destroyed by the enemy. Supposing that this loss were divided equally among all the people in the United States, it would mean that each man, woman and child would lose about ten dollars in one year. If the loss could be so divided up, perhaps no very great calamity would ensue. But, of course, no such division could be made; with the result that a great many people, especially poor people, earning wages by the day, would lose more than they could stand. Suppose, for instance, that a number of people earning about nine hundred dollars a year, by employment in export enterprises, were the people upon whom the actual loss eventually fell by their being thrown out of employment. This would mean that more than a million people, men, women and children, would be actually deprived of the means of living. It seems clear that such a thing would be a national disaster, for any loss of money to one man always means a loss of money or its equivalent to other men besides. For instance: suppose A owes $20 to B, B owes $20 to C, C owes $20 to D, D owes $20 to E, E owes $20 to F, F owes $20 to G, G owes $20 to H, H owes $20 to I, and I to J. If A is able to pay B and does so, then B pays C and so on, and everybody is happy. But suppose that A for some reason, say a blockade, fails to receive some money that he expected; then A cannot pay B, B cannot pay C, and so on; with the result, that not only does J lose his $20, but nine men are put in debt $20 which they cannot pay; with the further result that A is dunned by B, B is dunned by C and so on; producing a condition of distress, which would seem to be out of all proportion to a mere lack of $20, but which would, nevertheless, be the actual result. So in this country of 90,000,000 people, the sudden loss of 900,000,000 dollars a year would produce a distress seemingly out of all proportion to that sum of money, because the individual loss of every loser would be felt by everybody else.

Since to a great manufacturing nation, like ours, the greatest danger from outside (except actual invasion) would seem to be the sudden stoppage of her over-sea trade by blockade, we seem warranted in concluding that, since *the only possible means of preventing a blockade is a navy,* the primary use for a navy is to prevent blockade.

This does not mean that a fleet's place is on its own coast, because a blockade might be better prevented by having the fleet elsewhere; in fact it is quite certain that its place is not on the coast as a rule, but at whatever point is the best with relation to the enemy's fleet, until the enemy's fleet is destroyed. In fact since the defensive and the offensive are so inseparably connected that it is hard sometimes to tell where one begins and the other ends, the best position for our fleet might be on the enemy's coast. It may be objected that the coast of the United States is so long that it would be impossible to blockade it.—Perhaps, but that is not necessary: it would suffice to blockade Boston, Newport, New York, the Delaware, the Chesapeake and the Gulf,—say with forty ships. And we must remember that blockade running would be much more difficult now than in the Civil War, because of the increased power and accuracy of modern gunnery, and the advent of the searchlight, wireless telegraph and aeroplane.

It may also be objected that the blockading of even a defenseless coast would cost the blockading country a good deal of money, by reason of the loss of trade with that country. True: but war is always expensive; and the blockade would be very much more expensive to the blockaded country; and though it might hold out a long while, it would be compelled to yield in the end; not only because of the blockade itself, but because of the pressure of neutral countries: and the longer it held out, the greater the indemnity it would have to pay. The expense of blockading would therefore be merely a profitable investment.

The writer is aware that actual invasion of a country from the sea would be a greater disaster than blockade, and that defense against invasion has often been urged in Great Britain as a reason for a great navy; so that the primary reason for a navy might be said to be defense against invasion. But why should an enemy take the trouble to invade? Blockade is easier and cheaper, and can accomplish everything that an enemy desires, unless there are enough battleships to prevent it.

Command of the Sea.—While the *primary* use of a navy seems to be to prevent blockade, a navy, like any other weapon, may be put to any other uses which circumstances indicate. For instance, the northerners in the Civil War used the navy not to prevent blockade, but to make blockade; the Japanese used the navy to cover the transportation of their armies to Manchuria and Korea; and Great Britain has always used her navy to protect her trade routes.

A general statement of the various uses of a navy has been put into the phrase "command of the sea."

Probability of War.—Inasmuch as an adequate navy can prevent blockade, besides serving other uses, and inasmuch as our annual expenditure on the navy is only about 8 per cent of the value of our exports, it would seem logical to conclude that such expenditure is advisable, unless it is a larger percent than is paid for insurance of other kinds, and with a smaller risk.

Of course, the percent is smaller; but what is the degree of risk? What is the degree of probability of war with a country able to blockade us?

This degree of probability cannot be determined as accurately as the probabilities of fire, death, or other things against which insurance companies insure us; and one reason is that insurance companies do not really insure against fire, for instance, but only against loss by fire, whereas a navy does insure against war. For this reason, the probability of fire can be figured out to be a definite fraction; but the probability of war between two given countries cannot be so figured out, because it is a variable quantity. As between two countries of equal wealth, the probability of war varies with the disparity between their navies, and is practically zero, when their navies are equal in power; and, other factors being equal, the *greatest probability of war is between two countries, of which one is the more wealthy and the other the more powerful.*

In reckoning the probability of war, we must realize that *the most pregnant causes of war is the combination of conflicting interests with disparity in power.* And we must also realize that it is not enough to consider the situation as it is now: that it is necessary to look at least ten years ahead, because it would take the United States that length of time to prepare a navy powerful enough to fight our possible foes with reasonable assurance of success.

Ten years, however, is not really far enough ahead to look, for the simple reason that, while we could get a few ships ready in ten years, we could not get many ready. If, for instance, some change in policies or in interests should make war with Great Britain probably within ten years, we could not possibly build enough ships to prevent our being beaten, and blockaded, and forced to pay an enormous indemnity.

Is there *no* probability of this? Perhaps there is no great probability; but there certainly is a possibility. In fact, it might be a very wise act for Great Britain, seeing us gradually surpassing her, to go to war with us before it is too late, and crush us. It has often been said that Great Britain could not afford to go to war with us, because so many of her commercial interests would suffer. Of course, they would suffer for a while; but so do the commercial interests of competing railroads when they begin to cut rates. Cutting rates is war—commercial war: but it is often carried on, nevertheless, and at tremendous cost.

Of course, just now, Great Britain does not wish to crush us; but it is certain that she can. It is certain that the richest country in the world lies defenseless against the most powerful; and that we could not alter this condition in ten years, even if we started to build an adequate navy now.

Yet even if the degree of probability of war with Great Britain, within say ten years, seems so small that we need not consider her, are there no other great powers with whom the degree of probability of war is great enough to make it wise for us to consider them?

Before answering this question, let us realize clearly that one of the strongest reasons that leads a country to abstain from war, even to seek relief from wrongs, actual or imagined, is a doubt of success; and that that reason disappears if another country, sufficiently powerful to assure success, is ready to help her, either by joining openly with her, or by seeking war herself at the same time with the same country. As we all know, cases like this have happened in the past. Great Britain knows it; and the main secret of her wealth is that she has always been strong enough to fight any two countries.

It is plain that a coalition of two countries against us is possible now. The United States is regarded with feelings of ex-

treme irritation by the two most warlike nations in the world, one on our eastern side and the other on the western. War with either one at the present moment would call for all the energies of the country, and the issue would be doubtful. But if either country should consider itself compelled to declare war, the other could not possibly be so blind to her opportunity as not to declare war simultaneously. The result would be exactly the same as if we fought Great Britain, except that our Pacific Coast would be blockaded besides the Atlantic, and we should have to pay indemnity to two countries instead of to one country.

A coalition between these two countries would be an ideal arrangement, because it would enable each country to force us to grant the conditions it desires, and secure a large indemnity besides.

Would Great Britain interfere in our behalf? This can be answered by the man so wise that he knows what the international situation and the commercial situation will be ten years hence. Let him speak.

EXPENDITURES.

Clearly, expenditures for a navy are not expenditures in the correct sense of the word. An "expenditure" is something which one person pays out to somebody else; but the money spent on our navy is not paid out to somebody else but to ourselves. Furthermore, not only is the money given to ourselves, but it provides employment. What civilized man in civilized communities needs more than any other thing, is employment and the wage therefor; so that whatever gives good employment and good wage is a national blessing of the highest order.

But not only does the yearly expenditure on our navy give good employment and good wages, directly and indirectly, to thousands of men; it also gives scope for the use of capital, and opportunity for the development and improvement of the most perfect grades of manufactured articles; opportunity for invention of the highest kind.

Therefore, it must be accepted as a fact, that in addition to the security assured, the existence of a navy properly proportioned to our wealth and foreign trade, and to the probability of war, does not impose a burden, but rather bestows a blessing.

WILL THE IMPORTANCE OF NAVAL POWER INCREASE OR DECREASE?

It is clear that the importance to a country of a navy varies with two things—the value of that country's foreign trade and the probability of war.

It is also clear that, other things being equal, the probability of a country becoming involved in war varies as the value of her foreign trade; because the causes of friction and the money at stake vary in that proportion.

Therefore, *the importance to a country of her navy varies as the square of the value of her foreign trade.*

In order to answer the question, therefore, we must first consider whether foreign trade—sea trade—is going to increase or decrease.

As to the United States alone, the value of our exports is about ten times what it was fifty years ago, and it promises to increase. But the United States is only one country, and perhaps her increase in foreign trade has been due to conditions past or passing. So—what is the outlook for the future—both for the United States and other countries? Will other countries seek foreign trade?

Yes. The recent commercial progress of Germany, Argentina, and Japan, shows the growing recognition by civilized and enterprising countries of the benefits of foreign trade, and of the facilities for attaining it which are now given by the advent of large swift, modern steamers: steamers which are becoming larger and swifter and safer every year, more and more adapted for ocean trade. For not only have the writings of Mahan brought about an increase in the sea power of every great country; but this increase has so aroused the attention of the engineering professions, that the improvement of ships, engines, and other sea material has gone ahead faster than all the other engineering arts.

The reason why the engineering arts that are connected with the sea have gone ahead more rapidly than any other arts is simply that they are given wider opportunity and a greater scope. It is inherent in the very nature of things that it is easier to transport things by water than by land; that water transportation lends itself in a higher degree to the exercise of engineering skill, to the attainment of great results.

The underlying reason for this difference seems to be that it is not possible to make any vehicle to travel on land appreciably larger than the present automobile, unless it run on rails; whereas the floating power of water is such that vehicles can be made, and are made, as large as forty-five thousand tons. Two ships, the *Mauretania* and *Lusitania* of forty-five thousand tons displacement, have been running for three years, larger vessels are building, and undoubtedly will be run: for the larger the ships, the less they cost per ton of carrying power, the faster they go, and the safer they are.

Sea commerce thus gives to engineers, scientists and inventors, as well as to commercial men, that great gift of the gods—opportunity.

The number of ships that now traverse the ocean and the larger bodies of water communicating with it aggregate millions of tons, and their number and individual tonnage are constantly increasing. These vessels cruise among all the important sea ports of the world, and form a system of intercommunication almost as complete as the system of railroads in the United States. They bring distant ports of the world very close together, and make possible that ready interchange of material products, and that facility of personal intercourse which it is one of the aims of civilization to bring about. From a commercial point of view, London is nearer to New York than San Francisco, and more intimately allied with her.

The evident result of all this is to make the people of the world one large community, in which, though many nationalities are numbered, many tongues are spoken, many degrees of civilization and wealth are found, yet, of all, the main instincts are the same: the same passions, the same appetites, the same desire for personal advantage.

Not only does this admirable system of intercommunication bring all parts of the world very closely together, but it tends to produce in all a certain similarity in those characteristics and habits of thought that pertain to the material things of life. We are all imitative, and therefore we tend to imitate each other; but the inferior is more apt to imitate the superior than vice versa. Particularly are we prone to imitate those actions and qualities by which others have attained material success. So it is to be expected, it is already a fact, that the methods whereby a few

great nations attained success are already being imitated by other nations. Japan has imitated so well that in some ways she has already surpassed her models.

With such an example before her, should we be surprised that China has also become inoculated with the virus of commercial and political ambitions? It cannot be many years before she will be in the running with the rest of us, with four hundred millions of people to do the work; people of intelligence, patience, endurance and docility; people with everything to gain and nothing to lose; with the secret of how to succeed already taught by other nations, which she can learn from an open book.

If Japan has learned our secret and mastered it in fifty years, will China not be able to do it in less than fifty years.

Before we answer this question, let us realize clearly that China is much nearer to us in civilization than Japan was fifty years ago; that China has Japan's example to guide her, and also that any degree of civilization which was acquired by us in say one hundred years will not require half that time for another nation merely to learn. The same is true of all branches of knowledge: the knowledge of the Laws of Nature which it took Sir Isaac Newton many years to acquire may now be mastered by any college student in two months. And let us not forget, besides, that almost the only difficult element of civilization which other people need to acquire, in order to enter into that world-wide competition which is characteristic of the time we live in, is "engineering" broadly considered. Doubtless there are other things to learn besides; but it is not apparent that any other things have contributed largely to the so-called new civilization of Japan. Perhaps Japan had advanced enough in Christianity to account for her advance in material power, but if so she keeps very quiet about it. It may be, also, that the relations of the government to the governed people of Japan are on a higher plane than they used to be, but on a plane not yet so high as in our own country; but has anyone ever seen this claimed or even stated? It may be that the people of Japan are more kindly, brave, courteous and patriotic than they were, and that their improvement has been due to their imitating us in these matters; but this is not the belief of many who have been in Japan. One thing, however, is absolutely sure; and that is that Japan's advance has been *simultaneous* with her acquirement of the engineering arts, espe-

cially as applied to military and naval matters and the merchant marine.

But even supposing that China does not take part in the world-wide race for wealth, we cannot shut our eyes to the fact that Great Britain, Germany, France, Italy, Japan, Argentina and the United States; besides others like Sweden, Norway, Belgium, Holland, Spain and Portugal, are in the race already; and that several in South America bid fair to enter soon. Not only do we see many contestants, whose numbers and ardor are increasing, but we see, also, the cause of this increasing. The cause is not only a clearer appreciation of the benefits to be derived from commerce across the water under conditions that exist now; it is also a growing appreciation of the possibilities of commerce under conditions that will exist later; with the countries whose resources are almost entirely undeveloped. For four hundred years, we of the United States, have been developing the land within our borders, and the task has been enormous. At one time it promised to be the work of centuries; and with the mechanical appliances of even one hundred years ago, it would have taken a thousand years to do what we have already done. Mechanical appliances of all kinds, especially of transportation and agriculture, have made possible what would, otherwise, have been impossible; and mechanical appliances will do the same things in Tierra del Fuego and Zululand.

Mechanism, working on land and sea, is opening up the resources of the world. And now, another allied art, that of chemistry, more especially biology, is in process of removing one of the remaining obstacles to full development, by making active life possible, and even pleasant, in the tropics. It is predicted by some enthusiasts that, in the near future, it will be healthier and pleasanter to live in the tropics, and even do hard work there, than in the temperate zone. When this day comes, and it may be soon the development of the riches of lands within the tropics will begin in earnest, and wealth undreamed of now be realized.

The opening of the undeveloped countries means a continuing increase of wealth to the nations that take advantage of the opportunity, and a corresponding backsliding to those nations that fail. It means over all the ocean, an increasing number of steamers. It means the continuing increase of manufacturing in manufacturing countries, and the increasing enjoyment in them

of the good things of all the world. It means in the undeveloped countries an increasing use of the conveniences and luxuries of civilization and an increasing possession of money or its equivalent. It means, throughout all the world, an increase of what we call "Wealth."

In discussing a subject so great as sea trade, while it may be considered presumptuous to look fifty years ahead, it can hardly be denied that we ought at least to try to look that far ahead. To look fifty years ahead, is, after all, not taking in a greater interval of time than fifty years back; and it certainly seems reasonable to conclude that, if a certain line of progress has been going on for fifty years in a perfectly straight line, and with a vigor which is increasing very fast and shows no sign of change, the same general line of progress will probably keep up for another fifty years. If we try to realize what this means, we shall probably fail completely and become dazed by the prospect. We cannot possibly picture accurately or even clearly to ourselves any definite conditions of fifty years hence; but we certainly are warranted in concluding that by the end of fifty years, practically all of the countries of the world, including Africa, will be open to trade from one end to the other; that the volume of trade will be at least ten times as great as it is now; that the means of communication over the water and through the air will be very much better than now; and that there will be scores of appliances, methods and processes in general use of which we have, as yet, no inkling, and cannot even imagine.

Now let us call to mind the accepted proverb that "Competition is the life of trade," and this will make us see that, accompanying this stupendous trade, extending over, and into, every corner of the world, there will be stupendous competition, involving in a vast and complicated net, every red-blooded nation of the earth.

We seem safe in concluding therefore, that the importance of naval power will increase.

THE DANGER FROM A GREAT NAVY.

The power that a navy can wield may be urged by some as a reason against creating it; on the ground that while such great power may be desired by naval officers, and desired even by the government; and while, from their standpoint, a navy should

be as powerful as possible, and as directable as a swordsman's sword,—yet, from the standpoint of the citizen, such a condition would be a danger to the country at large, because it would have all the elements of danger that a standing army has, but developed to a much higher point.

To this it may be answered that, although naval power is the greatest power we know of, yet, like some explosives, it combines tremendous power with perfect safety. Because a thing is powerful it is not necessarily dangerous; a thing is dangerous, not because it is powerful, but because it is uncontrollable. Now a navy, although it can make itself very disagreeable to the government, as Brazil's navy has recently done, can speedily be reduced to impotency by depriving it of food and fuel.

ARBITRATION, LIMITATIONS OF ARMAMENT, ETC.

A great deal is said and written nowadays about the ability of arbitration to make wars unnecessary, and a good deal also about the possibility of an agreement among the nations, whereby armaments may be limited to forces adequate to ensure that every nation shall be compelled to abide by the decision of the others in any disputed case.

In view of the number, the earnestness and the prominence of many of the men interested in this cause: in view of the number of arbitration treaties that have been already signed: in view of the fact that arbitration among nations will simply establish a law among them like the law in any civilized country: in view of the fact that individuals in their dealings with each other sometimes surrender certain of their claims, and even rights, for the common good: in view of the fact that nations, like all business firms, like to cut down expenses, and in further view of the fact that a navy is not directly, but only indirectly, a contributor to a nation's prosperity, it seems probable that arbitration will be more and more used among the nations, and that armaments may be limited by agreement. It is clear, however, that the practical difficulties in the way of making the absolute agreement required are enormous, and that the most enthusiastic advocates of the plan do not expect that the actual limitation of armaments will become a fact for many years.

After the necessary preliminaries shall have been arranged, and the conference takes place which shall settle what armament

each nation may have, it is plain that it will be to the interest of each nation to keep down the armament of every other nation, and to be allowed as much as possible itself. In this way, the operation of making the agreement will be somewhat like the forming of a trust among several companies, and the advantage will lie with that nation which is the most powerful.

For this reason it would seem a part of wisdom of each country to enter the conference with as large a navy as possible.

Therefore, the probability of an approaching agreement among the nations as to limitation of armaments, instead of being a reason for abating our exertions towards establishing a powerful navy, is really a conclusive reason for redoubling them.

How Great Should Our Navy Be?

This may seem a question impossible to answer. Of course it is impossible to answer it in terms of ships and guns; but an approximate estimate may be reached by considering the case of a man playing poker who holds a royal straight flush. Such a man would be a fool if he did not back his hand to the limit and get all the benefit possible from it. So will the United States, if she fails to back her hand to the limit, recognizing the fact that in the grand game now going on for the stakes of the commercial supremacy of the world, she holds the best hand. She has the largest and most numerous sea ports, the most enterprising and inventive people: and the most wealth with which to force to success all the various necessary undertakings.

This does not mean that the United States ought, as a matter either of ethics or of policy, to build a great navy in order to take unjust advantage of weaker nations; but it does mean that she ought to build a navy great enough to save her from being shorn of her wealth and glory by simple force, as France was shorn in 1871.

It is often said that the reason for Great Britain's having so powerful a navy is that she is so situated geographically that, without a powerful navy, to protect her trade, the people would starve.

While this statement may be true, the inference usually drawn is fallacious: the inference that if Great Britain were not so situated, she would not have so great a navy.

Why would she not? It is certain that that "tight little island" has attained a world-wide power, and a wealth per capita greater than those of any other country; that her power and wealth, as compared with her home area, are so much greater than those of any other country as to stagger the understanding; that she could not have done what she has done without her navy; that she has never hesitated to use her navy to assist her trade, and yet that she has never used her navy to keep her people from starving.

In fact, the insistance on the anti-starvation theory is absurd. Has any country ever fought until the people as a mass were starving? Has starving any thing to do with the matter? Does not a nation give up fighting just as soon as it sees that further fighting would do more harm than good? A general or an admiral, in charge of a detached force, must fight sometimes even at tremendous loss and after all hope of local success has fled, in order to hold a position, the long holding of which is essential to the success of the whole strategic plan: but what country keeps up a war until its people are about to starve? Did Spain do so in our last war? Did Russia fear that Japan would force the people of her vast territory into starvation?

No—starvation has nothing to do with the case. If some discovery were made by which Great Britain could grow enough to support all her people, she would keep her great navy nevertheless —simply because she has found it to be a good investment.

The anti-starvation theory—the theory that one does things simply to keep from starving—does apply to some tropical savages, but not to the Anglo-Saxon. Long after starvation has been provided against, long after wealth has been secured, we still toil on. What are we toiling for? The same thing that Great Britain maintains her navy for—wealth and power.

The real reason for Great Britain's having a great navy applies with exact equality to the United States. Now that Great Britain has proved how great a navy is best for her, we can see at once how great a navy is best for us. That is—since Great Britain and the United States are the wealthiest countries in the world, and since the probability of war between any two countries is least when their navies are equal in power,—the maximum good would be attained by making the United States Navy exactly equal to the British Navy.

EFFICIENCY.

Inasmuch as the naval power represented by any fleet depends on its efficiency as well as on its numerical strength; and inasmuch as our fleet will be required, within not many years, to fight the fleet of some foreign power, or powers, in a war greater than any that has ever yet occurred, to decide whether the progress of the United States shall continue or shall cease, we, naval officers, see before us the necessity of shouldering responsibilities more racking and far-reaching than can ever come to men in any other calling.

It may be interesting, therefore, to consider, broadly, in what general directions we should work, to make our navy as efficient as possible; not including any great questions of strategy, drill or tactics, which are sciences in themselves, and which must be adapted to changing conditions year by year, but merely some simple principles, which, if rightly apprehended and correctly stated, will be permanent guides for thought and action.

The subject may be considered in its two main divisions, material and personnel.

MATERIAL.

While it is plain that the material is dominated by the personnel, and is therefore subordinate to it, and while the difference between them seems clear in all our minds, yet nevertheless it would be difficult to define that difference, and to state its intrinsic features.

The difficulty appears as soon as a little reflection leads us to see that people, as well as machines, are composed of matter, controlled by mind and spirit. We can all see this, even if we neglect any consideration as to the ultimate constitution of matter; for we agree closely enough for the purposes of this paper as to what matter is, and know that the bones and flesh of the human body are as truly matter as are the steel and brass parts of an engine.

In fact, there is a curious likeness between man and mechanism, for both are made of inert matter, but are capable of prodigious activity when vivified. The Bible tells us that God made man out of the dust of the ground and afterwards breathed into his nostrils the breath of life: and we see a hundred times a day some combination of brass and iron parts begin to do the most wonderful things, as soon as some one opens a valve, or closes a switch.

In both man and mechanism we see ordinary matter act in obedience to laws, some of which we do not understand at all and some of which we understand in only a restricted sense. But in even those cases which we seem to understand—say the nourishing effect of food, or the energizing effect of burning coal,—we know that behind each one has been the Creative Mind.

So, may we not say that in both man and mechanism we see the direct effect of mind on matter?

Matter is often called "dead;"—but it just as much alive as bones and flesh *per se;* and a machine without steam or electricity, or other element that gives it life, is no more dead than a human body, from which the spark of life has fled.

In fact, it is very much less so; because, even if badly deranged, it can, with sufficient pains, be restored to health; and with a supply of steam or electricity, it will start again sturdily at its work; while nothing can put the spark of life into the dead body of a human being. And not only in this way but in another is machinery less lifeless than a human body; in the quality of progress. The human body does not progress; it remains the same from generation to generation; but mechanism is of such a nature that each improvement forms a stepping stone for improvements yet to come.

In two essentials of living, in strength to do, and in delicacy to perceive, mechanism surpasses anything to which man can dare to aspire. This does not mean that there are no things which man can do which mere mechanism cannot do; for such an assertion would be absurd. Mere mechanism, perhaps, has no consciousness of its own existence; cannot consciously see, smell, hear or feel; has no conscience, and cannot think (so far as we know); yet there can be no question that the photograph can produce pictures of things which the eye, unaided, cannot see; that the microphone can pick up vibrations which the ear, unaided, cannot hear; that chemical tests detect essences far more delicately than can human smell or taste; that electric contact is far more accurate than human touch. And while it may be true that mechanism cannot think, some of its operations surpass in quickness and precision the mind and nerve coordination of the human body. If we wish to find out how long it takes for the finger to press an electric button, after a certain signal has been made, we find out by electric mechanism; that is, although man assumes that the human ma-

chine is the most highly organized machine there is, we use an ordinary electrical machine to test the degree of perfection of one of the human machine's most wonderful faculties.

Mechanism cannot think: but what is thinking and what does thinking accomplish? In the lives of most people, all the thinking they do is devoted to getting them through life with the least trouble and the most enjoyment. Yet everybody knows that their thinking, even along this line, is not very efficacious; they do not even know how much to eat and drink, while automatic stokers feed the exact amount of coal required, no more and no less, and an ordinary street car pumps up its air tank automatically.

These are mechanisms invented by man, yet they do things that man himself cannot do. And some mechanisms invented by man, such as the wireless telegraph, possess an inherent delicacy compared with which the nerves of the human body are as coarse as manila hawsers.

But why multiply examples of things which mechanism can do and man cannot do,—when the objection will be made at once that mechanism does not do these things, but that man does them using mechanism as his tools?

Granting that he does, is not man merely a medium between the Almighty and the mechanism? Is he not merely an intermediate mechanism? There are many people who believe that man does not do so much as he thinks he does, and that he himself is as much a tool in the hands of Providence as a hammer is in his hands. One fact is certainly clear; and that is, that man is not the master of mechanism, for the simple reason that he can not control mechanism after he has once "created" it, or undo what he has done. After Bell had invented the telephone, he became powerless to control it. He could not uninvent it, he could not return conditions to the point from which he had moved them. Having certain forces at work, he had to sit an almost helpless spectator of the effects of which his own invention was the cause.

Returning to practical affairs, and looking back to man's first discovery of fire, and his fashioning of his first rude implements, and watching his progress to his present high estate of material well being, do we not see clearly that man himself has changed but little in all the centuries; that systems of government and philosophy have merely kept society in order, and maintained the

status quo; and that the principal means by which man has achieved his present material prosperity has been by overcoming material difficulties, by inventing and developing material mechanisms?

If this has been so in the past, will it not be so in the future? If so,—the principal means by which a man will be able to make his material condition better still will be by inventing and developing material mechanisms.

Now in what field do we find to-day the largest use of mechanism? The navy. What field gives the greatest promise to the inventor, the physicist and the engineer? The navy. What thing gives such an opportunity for the invention, development and use of mechanism, that—if wisely treated—it will become the most potent instrumentality in all the world for advancing civilization and the power of civilized nations? The navy.

Our warships have acquired a power, a vastness, and a multiplexity of functions, such that they offer an almost infinite field for the development of good ideas. The warship, more than any other thing, is a little world in itself. It must be self-sustaining, it must be self-contained, it must go to all parts of the world and be able in all parts of the world to deal the strongest blow, and withstand the strongest blow that science and art make possible. And as the people on board are subject, more than any other people, to the dangers of varying climates, of accidents, and of war; and as their guns, torpedoes, electric mechanisms of all kinds, and all their appliances, must combine the highest possible power with the highest possible delicacy, there seems no limit to their requirements in the matter of mechanism; there seems no kind of mechanism for which they may not find a use; there seems no limit to the power that they will reach.

If we agree that our material should be as efficacious as possible, we shall probably go ahead as we have been doing in the past few years, and keep up with the progress of the engineering arts. We feel perfectly safe in assuming this, for the officers and men of the navy are an exceedingly intelligent and enterprising body; and the task of keeping our material up to the times is a definite task, performable by hard work, directed by good judgment and common sense.

But there is a duty that we ought to do, that we never have done, and that we Americans can do better than any other people in the world.

This duty is to take advantage of the national inventive genius of our country and encourage—not merely engineering skill, not merely mechanical ingenuity—but real invention. Knowing the brilliant original inventive genius of our countrymen, and the dazzling opportunities of the future, we must not stop short of a determined effort to "ascend the highest Heaven of invention." We must hold as high an ideal in this matter as we do in the matters of strategy, tactics and engineering.

Such a policy, wisely and energetically carried out, will have as direct and beneficial effect on the navy as our admirable patent system has on the country at large. But, to carry it out, we must first treat inventors as sane and reputable men, and recognize the fact that not only does an attempt to evade plain patent rights seem to inventors as dishonorable, but it turns inventors to fields where they have more chance than in a battle against the Government.

Why inventors should be treated as they have been is not quite clear. Why encourage authors to publish books on naval subjects and reap not only the money but the glory;—and then deny to inventors—no matter what pecuniary sacrifices they may have made in developing their inventions—all remuneration and all glory? Certainly it has been neither wise nor right to humiliate a class of men who have been useful in the past, and can be made useful in the future.

What is gained by such a policy? A little money is saved sometimes: but is it not a little like saving money by not paying a tailor's bill?

Certainly it is not right for a great government to violate its own patent laws, and infringe patents which the government itself granted and for which it received $35 each.

Does anyone deny that the inventor is a necessity of progress? Does anyone deny that the inventor must precede the engineer—that conception must precede development? Does anyone deny that our electric lights, torpedoes, guns and engines were invented before they were developed; that they were conceived before they grew and waxed into maturity? Does anyone deny that, but for inventors, the coal and iron and brass of our ships would still be in the bowels of the earth?

We all know that ideas are what have breathed the breath of life into material brass and iron, and made cities and churches,

and pictures and books, and ships,—and every single thing that distinguishes men from brutes. *It has already been possible for one invention to increase the hitting power of naval guns at least ten times.* Why not develop such things as soon as possible in secret, and secure the military advantages accruing; instead of resisting them until all the world knows about them, and then being tremendously secret about details that any intelligent mechanic can vary in a dozen ways?

PERSONNEL.

When thinking of a naval power, one cannot help thinking of Great Britain, which has pushed naval power to a point far beyond that attained by any other nation, and far beyond the dreams of not many years ago. And one cannot help thinking, too, of France, almost in sight of England; a country of more natural wealth, with a longer coast line to guard, and formerly with a greater population; a country, which not many years ago, was equal to Great Britain in naval power, but which is now immeasureably behind her, and is becoming more so with each succeeding year.

Why is it that Great Britain has surpassed France in naval power? We are familiar with many of the answers given; the policy of the Government, the killing of many French officers during the Reign of Terror, the greater need of Great Britain for a navy, etc. But is there not another factor as great as any of these: the difference in the characters of the two peoples?

Daring.—Some years ago, in the harbor of Toulon, the writer had the opportunity on several occasions of watching the sailors of French battleships, while in swimming. He had often seen the sailors of our ships and of British ships when in swimming from their vessels; and the occasions were always those of boisterous merriment and frolic, in which many men would jump from the lower yards and the davit heads, and dive backwards from the booms; but he was amazed, at first, to see the French sailors glide very carefully down the lower booms, until they reached the water, and then drop into the water in the gentlest fashion. There was an utter absence of that rollicking, devil-may-care, risk-taking element that is so plainly to be seen when American or British sailors are in swimming.

While not accusing the French people of timidity, may not one say that this apparently unimportant difference in swimming indicated an extremely important difference in character? And is not one safe in saying that the French are much more prudent than the British? Certainly they are more prudent in money matters; and while the individual Frenchman is, because of his prudence, or thrift, as comfortably established in life as the Englishman, yet the prudence of the Frenchman makes him shrink from risking money in large enterprises; with the result that Great Britain, Germany, and the United States have far outstripped France in those great commercial enterprises, which require for their success the risking of money. And it is well known that the Frenchman's prudence has caused the lowering of the birth-rate of France to such a degree that she is already in a condition from which it will be very hard to extricate herself.

Ruggedness.—Associated with the prudence of the Frenchman, is a quality somewhat allied, and yet a little different; the shrinking from disagreeable things. We all shrink from disagreeable things, but the Frenchman seems more sensitive to disagreeable things than the Briton. He is more fastidious; he cannot "endure hardness" to an equal degree. If a British ship and a French ship are in the same harbor, we see the British officers taking long walks ashore in ugly clothes with heavy boots, perhaps in the rain and mud; a thing amazing and almost revolting to the French, who prefer to go ashore in a gentlemanly fashion, and sit down in the club and read, and smoke cigarettes.

Now supposing that this comparison of the individual Frenchman and the individual Briton is substantially correct, and supposing that we knew that there were two fleets, one manned by British and the other manned by Frenchmen,—and that we knew that one was the blockader and the other the blockaded in a port, would not any man wager at once that the British would be the blockaders and the Frenchmen the blockaded? Or suppose we knew that one of two fleets of sailing ships took the weather gauge, and forced the fighting, while the other took the lee gauge and accepted the attack; would not any man in the world know immediately that it was the British who were forcing the fighting and the Frenchmen who were awaiting it? Surely anyone would know which would take the weather gauge and which the lee gauge; and anyone would know which would be the better sailor.

While it would be incorrect to state that the Briton enjoys being hurt, he does not mind being hurt so much as does the Frenchman: he is tougher; he is more rugged; he is not so easily turned from his path by some unpleasantness; he does not mind hardship so much as does the Frenchman.

This ruggedness, with its accompaniment of fondness for outdoor life, has brought about in the Briton (or at least the two qualities co-exist) a superior physique; this meaning not necessarily greater freedom from disease, or greater longevity, but a greater physical strength, a greater ability to withstand the rigors of the elements,—a capacity for feeling comfortable when other people are most uncomfortable. This ruggedness is needed by the sailor more than by the soldier, whose hardships, while at times as great as those of the sailor, are of very much less frequency and duration.

Since a man accustomed to hardship is not so easily dismayed by an undertaking involving hardship as a man who is not accustomed to it; since a man accustomed to hardship is not so apt to lose his equanimity under unpleasant conditions; since a man's equanimity is one of his greatest assets; since a man of even temper is apt to have better judgment under trying conditions than a peevish or irritable man, the proverbial equanimity of the Briton would seem to be due in some measure to his rugged mode of life, and to account in some degree for his success in attaining naval power.

By an effort of will a man accustomed to luxury may force himself to undertake severe hardship; and a man habituated to self indulgence may be master of himself under bad conditions; but it must be true as a matter of common sense that, if two nations are otherwise equal, but one nation is composed of daring men, inured to hardship, while the other is composed of prudent men not inured to hardship, the former will be able to create the greater naval power.

As an important feature of the personnel, therefore, it would seem wise to follow St. Paul's advice, and learn to "endure hardness."

Spirit.—Yet mere ruggedness and strength, mere physical courage even, will not avail to produce great naval power, if a nation's men are not inspired with a curious essence, which is not physical or mental, but is wholly spiritual. So great is the potency of this

essence that, under its influence, men and women of the most delicate physique have risen to the loftiest heights of daring and endurance. It is this which, often carried to excess, makes the runner or the oarsman die in the race; the thing which gives the football match its character; which made the Christian martyrs what they were; which has enabled many so-called suffragettes in England to starve to death, rather than to surrender.

We all know what this quality is, though it is called by several names: "pluck," "grit," and "sand," are perhaps the names most used in English; but the word "spirit" seems to express the quality itself and also the cause behind it. It is the spirit, as distinguished from the body or the mind; it is seen in brutes, but it is spirit just the same. It enables a man, sometimes a brute, to be superior to circumstances, often to dominate them. Associated with it are will, determination, courage, endurance, etc.; but they are all inspired by spirit, the direct gift of the Almighty.

Mahan speaks of Nelson as being the "embodiment of the sea power of Great Britain." Why? Many officers have attained higher rank than Nelson; many have commanded larger fleets; many have been more impressive, more learned, and in the usual sense of the words, better officers than Nelson. But Nelson had something in him that enabled him to triumph over his poor weak body, and his various faults and deficiencies of character, and be the greatest naval officer that ever lived. That something was spirit; an impetuous and yet perfectly guided spiritual force, that carried along not only him, but everybody under him. There was no such man in the French navy, but there was such a man in the French army, whose name was Napoleon. It is doubtful if Nelson had the same intellectual power as Napoleon, but this can never be determined, because Nelson lived in a comparatively restricted field. But Napoleon was not intellect alone, he was a tremendous force. He and Nelson were alike in their little bodies and their impetuous activity, which put impetuous activity into everybody else, and made one the greatest sailor of modern times and the other the greatest soldier.

Probably this spirit is shown in a higher degree by the Japanese than by any other nation. It seems almost possible for the men of a Japanese regiment to be not individuals at all, but simply parts of the regiment. The Japanese attitude towards the Mikado

and towards Japan is one that we cannot understand, or they explain to us; but it is said to be one of the uttermost devotion.

What single factor can be a greater influence for good in any personnel than a spirit that fears no pain, or danger, and binds all together in a vehement devotion to a common cause?

Discipline.—Of course, it is one of the efforts of discipline to keep down in men any tendency to resist the will of the directing authority; this is usually done by a system of punishments. It is also an effort of discipline to develop a tendency to assist the will of the directing authority; this is usually done by a system of rewards. There has also come into existence, within the past few years (or, more correctly speaking there has been very greatly developed from a very small beginning,) another plan for developing this spirit of assistance, and this is by developing a spirit of competition—a method very largely used in commercial life, but not much used in the navy until lately.

All these methods recognize discipline as merely a means towards an end, and not an end in itself; a means that takes account of a man as a man.

Or, it may be said, by no very great stretch of the meaning of words, that they take account of man as a certain kind of machine, and employ certain ways of actuating him, which are efficacious because of certain definite properties that characterize a man. It may be said that if we get a man to do a thing by giving him a dollar, we are actuating internal mechanism just as much as if we put a penny in the slot of an automatic vendor.

Perhaps there is a little truth in this idea, even though it seems somewhat uncomplimentary to the human race; and, it makes us realize that, in order to handle men well, we must understand the motives by which they are actuated, so that we shall know which button to press and when; and know that some buttons ought not to be pressed at all. Not only this, but it makes us realize that no two men can be treated in exactly the same way, or even one man on two different occasions. We all know this in the abstract, and yet how few of us utilize our knowledge well!

But even if some of us lack that keen apprehension of human nature that some people have, and that exceedingly skilfullness in knowing just what, and when, and how, to say and to do, we can at least note a few general truths which are of almost universal application, and which some few people seem to know intui-

tively and apply unconsciously, or at least without effort. These truths are of the simplest kind; and an appreciation of them leads us to see how some officers always get their work done efficiently, without seeming to have any trouble with their subordinates; while others, who do not accomplish any more are perpetually reporting somebody to somebody for something, and are in hot water with some one nearly all the time. Certainly this phenomenon is apparent everywhere; certainly it is important; certainly it must be in accordance with some rules or laws;—and yet where are those rules and laws to be found?

While the writer does not pretend to know much about this himself, he ventures to suggest that it has to do very closely with the presence or absence of sympathy. Of course, sympathy does not mean a disposition to allow a subordinate to continue in neglect or wrong-doing, simply because such neglect or wrong-doing may be convenient to the subordinate; but it does mean a correct appreciation of the rights of that subordinate as a man, and of the fact that we can do nothing but harm by needlessly wounding him. It recognizes the fact that he has feelings, or ought to have; that he has pride or ought to have,—and it even realizes the fact that no man can walk a line exactly straight, and that certain waverings to the right and left must be allowed to every man. All attempts to regulate the lives of men with a degree of rigidity which is greater than the power of man to be rigid, must be mistakes due to a fundamental ignorance of human nature. They are like the constant exhortation "Keep quiet," which some unthinking parents repeat from morning to night to their little children, whose restless little bodies were not intended by the Almighty to keep quiet, or he would not have made them so restless.

Another truth, which one almost blushes to mention, because it is so commonplace, is the one expressed in the old adage, "Example is better than precept." If the officers in one ship tried as hard as they could to do all their duty as well as they could, and were considerate towards each other and towards the men; while the officers of another ship, of equal professional knowledge and experience, did not try very hard to do their duty, and were perpetually wrangling with each other, and were unjust and inconsiderate towards each other, and towards the men, is there any possibility that the discipline in the second ship could be as good as in the first?

Example is better than precept; and the higher the position of the man who sets the example, the greater the effect. Can the captain who is habitually surly and rude expect that his officers and men will be habitually respectful and polite? Can the executive officer who indulges in the luxury of saying cutting things to his subordinates expect that they will say respectful things of him or feel respectful towards him; or can he expect that, on some occasion, the restraint of discipline will not be broken down, with the inevitable court-martial afterwards? Can the watch officer who is negligent and unobserving expect that the boatswain's mates, coxswains, and lookouts will keep on the *qui vive?*

At one time, flogging was used in the navy as a means of discipline; but flogging was abolished, and it was found that the ships got on just as well without it. Since that time, the treatment of the enlisted men in the service has been getting better and better, and the only results have been good results. Of course, this does not mean that flogging may not have been necessary at one time; in fact there is very good reason to believe that it was necessary. Sixty years ago, men were not so well educated as they are in the United States today. But now our public school system, and the strictness with which order is maintained in our tremendous cities, are such that most children absorb an understanding of the necessity and value of obedience to authority, long before the age at which young men enter the navy. This condition of things has been growing gradually with the years; so that men, when they enlist in the navy, have already learned a certain measure of obedience. Therefore the gradually increasing gentleness towards the enlisted man has been merely a continuous adaptation to changing conditions, due to the necessity of getting good men into the navy and keeping them.

But if it has been desirable in the past to have good men in the navy, it is becoming more so, and will continue to become more and more so, with every advance made in mechanism and invention, and with every attempt to make our organization what it should be, a system of trustworthy units. In every machine, no matter how magnificent, its perfect working is dependent upon even the smallest parts. A few grains of sand in the main bearings may stop the mightiest engine; the failure of an electrical contact may cause a disaster; the mistake of a spotter, or an error in some sub-station, may lose a battle.

Organization.—An organization of men is strikingly like a living organism in that it comprises a number of branches which have functions that are separate, are each separately necessary to the life of the whole, and yet are mutually dependent, and are themselves sub-divided.

It seems to be a law of nature that the more highly organized the structure of any living organism, that is, the higher it is in the scale of nature, the more complex is its structure, and vice versa.

It is the same with organizations. The simplest kind of an organization is one in which there is only one kind of thing to do; the boss managing a gang of street sweepers is an illustration of this kind of organization. Somewhat higher we find the organization of an infantry company, in which the number of things to be done is not very great, and the number of divisions is not very great. The most complex organization and the one in which there are the greatest number of different kinds of things to do, is a modern navy. Between a modern navy and a gang of laborers are thousands of organizations of different degrees of complexity; and through them all we see the same law running, that the higher the order of the organization and the more multifarious its faculties, the more complex it is.

The idea of organization is, of course, to get the combined effort of many men to produce a desired result; the whole effort being directed by one man, the head of the organization. This man cannot control directly a very large number of men, but it is plain that the number will decrease in proportion to the number of kinds of things that have to be done. For instance, one man might control 10 men very efficiently, if they were all doing the same thing in front of him, say sweeping a street; but he could not control 10 men very well, if they were in places far apart, and doing 10 different kinds of things.

Few organizations are so small and so simple that one man can personally direct efficiently all the men in the organization. Even in the simplest organization, it is necessary to divide the organization into parts, each under the control of a chief, and then to subdivide those parts. In fact, the idea of division and subdivision and sub-subdivision, seems inherent in the very idea of organization. If one man could control 10 other men perfectly, then one man, assisted by 110 men, could control 1000 men perfectly, and get done a thousand times as much work as one man can do.

But no man can control 10 men perfectly; and the result is a loss of efficiency that increases with the number of subdivisions. Suppose, for instance, that one man could control 10 men, with an efficiency of, say 90 per cent so that he could get the work of 9 men out of those 10 men. Suppose, further, that each of these ten men under him could also handle ten men with an efficiency of 90 per cent and each of those ten men could handle 10 men with an efficiency of 90 per cent. It will be seen that the first man would practically control perfectly, 9 men; that these nine men would control 81 men, and that those 81 men would control 729 men. That is, the first man instead of getting done a thousand times as much work as one man can do, could get only 729 times as much work done, although he would have 110 men to help him get it done. That is, the efficiency would be E^n, where n represents the number of times the organization is divided and subdivided.

This shows that in every organization the effort should be to keep down the tendency to subdivide, and the organization kept as simple as the different kinds of work to be done permit. Of course, even if only one kind of work is to be done, division and subdivision must be used if the organization is large. For instance, no colonel could handle personally a regiment of say a thousand men; and, except under peculiar circumstances, no colonel and ten captains could handle personally ten companies. The number of men that one man can handle efficiently depends, of course, on numberless circumstances; but it seems clear that the effort should be made to make this number as large as possible, by proper methods, so as to reduce the tendency to subdivide. One conclusion seems plain; and that is the number of men one can handle increases with the similarity of the men and their tasks; so that it should be the aim to make the units into which the organization is divided as similar as possible,—like the companies in an infantry regiment. This does not mean that any attempt should be made to make the units in the steam engineering department like the units in the ordnance department, because the functions of the two departments are utterly unlike. But it does mean, for instance, that two like units—say two gun divisions on the same deck—should not be clothed in different uniforms, receive different rates of pay, or belong to different branches of the navy.

Yet such a state of affairs exists on board our most modern ships, where no expenditure of time, money and mental effort has been spared, to make the ships the best that can be made. The Marines, who form so large a part of the complement of our ships, perform the same duties as ordinary seamen can, duties of the simplest kind, and yet they have an entirely separate organization, accounts, and *esprit de corps*.

Co-ordination.—A good illustration of co-ordination is to be found in a highly trained orchestra, in which we see many performers, not only playing different instruments, but different kinds of instruments, these different kinds of instruments playing different notes, and often in different time. And yet, under the sway of the skilled director, the result is the sweetest harmony we know.

The attainment of co-ordination is perhaps the most difficult part of the work of the head of a great organization. He himself, decides what policy he shall pursue in the relations of the organization to the external world, taking as much advice, or as little, as he may choose from his advisors and subordinates. In the line of external policy he is entirely independent of them; but when he attempts to co-ordinate their efforts along that line he is very dependent on them; and his ultimate success wil be a function of his success in co-ordinating their efforts.

The most obvious difficulty lies in the possible unwillingness of some subordinate to follow the line laid down. In a strictly military or naval organization this difficulty is not often met; and it would be a strange failure of the purpose of such organizations if that difficulty were often met; because their main purpose, as organizations, is—and always has been—to effect co-ordination. But in semi-military and other organizations, the difficulty is frequently met, and is sometimes extremely difficult to overcome. Often it cannot be overcome except by the removal of either the subordinate or the chief.

Another difficulty in effecting co-ordination lies in preventing the overlaping of the work of one division over the work of another division. Inasmuch as it is essential that there shall be no gaps left between the works of the different divisions, it is practically impossible to prevent a certain amount of overlapping: and here is always an abundant source of trouble. A curious phase of this trouble is that the more efficient and energetic the various divisions are, the more trouble there is apt to be.

Undue interference with the work of any division by a superior, is another source of trouble. No man in authority can have a good grip on his men, if a superior is continually interfering between him and them. Not only does it make him uncertain as to what he is expected to do, and can do, but it lessens his influence over his men; and this, not only because they cease to regard him with as much respect as they otherwise would, but because they naturally come to look to the higher chief, not only for directions, but also for promotion.

One of the greatest holds that the head of any division has over his men, is the fact that his men must look to him for promotion, or, more strictly speaking, recommendation for promotion. This fact is inherent in organizations, because they are organizations, and must not be ignored. If a captain of a ship, in going through the engineer's department, should be struck with the efficiency or industry of some man, and promote him, without the approval of the chief engineer, he would strike a blow at the very vitals of the organization of his own ship. If his selection happened to be a good one, and the man worthy of advancement, he would do wrong just the same. And this wrong would not be an academic or theoretical wrong, but the infliction of a definite and practical injury, and lessen the respect of every man in the ship for that spirit of co-ordination and discipline which it is the captain's duty to foster.

Of course this statement, like nearly all statements, does not mean that there are no possible exceptions to it. It does mean, however, that when a case comes up in which it is proper for one high in authority to interfere between the head of any division and his men, either in directing their work, or in giving promotion, the case must be recognized, either as an exceptional one, an emergency, or else a case in which the head of the division is not doing his work well; because if he is fit to be where he is, he must be able to direct the work of his individual men, and to know better than anybody else who are worthy of promotion; *not only because he is more familiar with the requirements, but because he is not apt to be unduly influenced by acts—good or bad—which, though noticeable, are accidental or infrequent.*

A man going into a billiard room might see a player make a very difficult shot; and unless he were an expert himself, would be apt to conclude that the man was an excellent player, whereas

the man might be a very poor player, and the shot merely a "scratch." *Thousands of men in actual life have received great promotion for single acts which came to the notice of high authority when those acts were simply "scratches."* On the other hand, many a very excellent and deserving man has received a set-back, because someone high in authority happened to see or hear of some act which was in itself deplorable, but which was almost an accident, totally out of harmony with the man's habitual life, and not at all indicative of his character and attainments.

Hope of promotion is a great incentive towards co-ordination. So great care must be exercised—not only in getting the best men, but in making responsible positions as attractive as possible, and making the accompanying titles exclusive. Even if civilians think our attitude towards titles is silly (and perhaps it is), yet nevertheless every man in the world would like to have a title, provided that title meant something honorable. But what use is there in having the title "Judge," no matter how fine a judge one may be, if everybody is called "Judge?" We all crave distinction; and even if this be egoism and vanity, it is one of the strongest forces in the world; and no one who deals successfully with men ignores it.

But if the desire for the distinction of a title is due to vanity, what shall we say of the desire for the distinction of a title that conveys to the world an erroneous impression of the duties and responsibilities of the man desiring that title?

It would be idle to assert that the mere bearing of a title that signifies an untruth concerning its bearer does no harm to a man who really is what his title describes; because everybody knows the reverse. *Every man who carries a title that conveys to the world a false impression, is doing definite harm to every man who carries that title rightfully.* It has been stated that one reason why Secretary Stanton made so many Brigadier Generals at the end of the Civil War was in order to degrade the title of "General," which Mr. Stanton wished to do because of his dislike of several generals, especially General Sherman. Whether this story be true or not, the fact that it exists shows that there is a belief in the minds of men that titles lose their value in proportion to the number of people holding them; knowing that the world is apt to accredit equally all possessors of any title, not having the time or the interest to make an examination into the exact degree in which each man has a right to his title.

Returning to the subject of co-ordination as a prime object of organization, let us remind ourselves that co-ordination may be divided into two parts, internal and external; internal co-ordination being the regulation of the various functions to produce harmonious action, and external co-ordination being the regulation of the organization as a unit with reference to the external world. Applying this idea to a navy, internal co-ordination would be the regulating of all the functions of a navy so as to produce the harmonious action of all its parts; while external co-ordination would be the regulating of the relations of the whole navy to the country of which it forms a part.

The internal co-ordination of the navy is what has thus far been touched upon in this paper, but it must be plain that its external co-ordination is at least as important.

External co-ordination must be as good as possible, or the country and the navy will not be in harmony. The country owns the navy and has a right to do with it as it wishes. Its co-ordination with the navy is effected through the President and the Secretary of the Navy. As the President has many things to attend to, he usually deals with the navy entirely through the Secretary; so that the co-ordination of the navy with the country is practically through the Secretary.

Now the Secretary is usually a man of high ability and character, well versed in the affairs of public life, and holding the confidence of the country. He is never a man of much knowledge of the navy when he first enters upon his duty; but he usually acquires enough after a greater or less stay in office to act successfully as the connecting link between the country and this curious complicated thing that is called a navy, which is so wholly different from anything else in the country that nobody outside the navy knows much about it.

There has been a great deal of criticism of the custom that prevails in Great Britain and the United States of having a civilian direct the affairs of the navy; but *how else can the navy and the country get together?* Naval officers belong to an isolated profession, which is just as technical and distinct as that of medicine; and they live so little among the people of the country, that it seems sure that, if any naval officer were made Secretary, he could not deal with Congress, the President, the newspapers, and the country at large, as well as a man can who had been doing those things successfully all his life.

This brief discussion of organization and co-ordination may perhaps be closed with the truism that, in deciding on the plan or conduct of any organization, we should keep most carefully and persistently in view the *main purpose* which it is intended to effect.

The Main Purpose.—Clearly, the main purpose of a navy is to build and maintain a fleet that can defend the country.

The factors that enter into the problem of building and maintaining such a fleet are international, political, naval, and technical. The first three factors are included in the word "strategic." The various factors, then, may all be included in the two words "strategic" and "technical."

Objection may be made to the omission of the word "tactical." While such an objection would clearly be sound, the writer wishes to state that the word "naval," as just used was intended to include such prevision of tactical probabilities as comes under the domain of strategy; and that his intention is not to speak of the tactical conduct of a fleet in actual battle, but merely of the measures to be taken in order to build and maintain a fleet that shall be able to fight that battle with success.

Now, while it is clear that the two factors, strategic and technical, are mutually interdependent and are both essential; so that neither factor should be declared more important than the other, yet nevertheless it is also clear that technical factors, in all the spheres of their employment, industrial as well as military, owe their value, not so much to their intrinsic qualities, as to the way in which those intrinsic qualities may be applied to the attainment of some desired result. A bridge builder, for instance, would not care for steel, no matter what were its qualities, unless he could utilize those qualities in building a bridge.

For this reason, all technical factors, in all the lines of their employment, must be regarded as factors contributory to the main purpose and, in a sense, subordinate. Sometimes, in fact often, the technical factors assume so much prominence that they obscure the main purpose; but this is a clear case of "human fallibility," and one against which we must most zealously and patiently guard.

It may now be asked—if the two factors in carrying out the main purpose are strategic and technical,—who are the men best fitted

to decide as to the proper policy to carry it out? The answer is clearly that, under the direction of the Secretary, naval officers are the men best fitted, and in fact the only men fitted, to decide as to the policy.

But who are "naval officers?" If one answers according to the dictionary, he will say that "naval officers are men who hold an office that is connected with a navy." If this definition be accepted, then every watchman in a navy yard, and every private marine, is a naval officer.

But this is a "*reductio ad absurdum,*" and is the result of an attempt to define in a few words what cannot be so defined. Many words in every language are so thoroughly understood, that they cannot be defined except by using words less well understood. Unless he befogs his mind by looking in the dictionary, every educated man knows perfectly well what a naval officer is. Every educated man knows that a naval officer is a nautical person, a man who goes to sea, whose work is done on the bridge, and in the turret, engine room, and fire room; whose mail is often a month late; whose life-long sorrow is his far and frequent absences from home; who handles guns, and drills men, and lives in an atmosphere of discipline and danger; who manages ships and all that they contain, and lives with them day and night; himself as essential a part of the fighting machine as one of the masts or turrets.

These men go up the successive steps of the professional ladder more systematically and rightfully than do the men of any other calling; acquiring at each step experience to be used on the step above, and not being permitted on any step until fitness has been proved. In natural sequence, each degree of responsibility is assumed; and, the scope as well as the degree of responsibility expanding, as higher steps are mounted, and coming responsibilities cast their shadows before, the natural career of the naval officer fits him gradually, but surely, for the correct apprehension of strategic problems, and all questions of naval policy.

This does not mean that nobody should be allowed to have anything to say about the navy but naval officers, but it does mean that naval officers should be the final judges about everything pertaining to the strictly naval side of the navy. It does not mean that naval officers should decide questions of hygiene, handle the

finances, construct the ships, or build the dry-docks; because all these special kinds of work can be done better by specialists who make those special kinds of work their lifelong study and profession, in the same way that naval officers make naval work their lifelong study and profession.

SHORE DUTY.

It has been suggested very often that, in our navy, naval officers are on duty on shore entirely too much. It has even been held that there is nothing distinctly naval in any duty on shore, and that all that is required to be done on shore for the navy should be done by civilians, so that naval officers could go to sea all the time except during occasional vacations on shore.

Without insisting too much that a naval officer is a man, and not an albatross, it may be pointed out that, even if this idea were true for a non-progressive navy, it cannot be true for a progressive navy. If we are to improve our numberless mechanisms continually, the people on shore who get these mechanisms ready for the ships, and the people on board the ships who test and use them must work together, with the common purpose of improving the mechanisms and the ships: and this they could not possibly do, if they were two unlike bodies of men. They could not understand each other, the people on shore could not possibly comprehend the essential features required for the practical use of the mechanisms on board and the people on board, not having the opportunity of keeping posted in the progress of mechanism on shore, would not be able to take advantage of the new mechanisms put in, even if the people on shore produced good ones.

We must never forget that *the naval profession comprises not only an art but a science also.* If it comprised an art alone, we could master it at an early age, and spend the rest of our lives on blue water, practicing that perfected but *stagnant* art. But since it is a science too, and since every science is infinite in scope, we must master as much of it as we can; and this requires periods of comparative leisure from executive duties, in properly equipped stations on the land. There we can study the principles of naval science—as fixed as the principles of every other science—and strive to apply them to the infinitely varying requirements of the naval art and the furtherance of naval power.

CONCLUSIONS.

The reflections set forth in this paper seem to lead to the following conclusions:

1. The increased power of navies is due primarily to the progress of the mechanical arts and sciences.

2. The rapid growth of ocean traffic; the augmentation in numbers and in power of ocean ships; the increased and still increasing diffusion of knowledge; the amazing growth of mechanism; the increased and still increasing appreciation of the value of wealth; the increased and still increasing love of luxury; the development of agriculture and transportation in even savage countries, combine to increase an ocean commerce that already covers the world, though thinly, and that will probably grow ten fold in the fifty years to come.

3. "Competition is the life of trade;" competition is the same thing as rivalry; "trade rivalry" is a common expression for a condition as common as trade, and inseparable from it. There is no rivalry more bitter than trade rivalry. There is no thing more dangerous to peace. There is no thing for which men will fight more savagely than for money.

4. Three of the great powers, Great Britain, Germany, and Japan, have built up navies that are so large, compared with their foreign trade, that we are forced to infer that they have determined to fight, to maintain any stand which their trade interests may impel them to take.

5. Two of these countries have causes of complaint against us which they consider just.

6. Each country now has a navy so powerful that, in case we went to war with her, the issue would be doubtful.

7. In a few years the navy of one of those countries will be much more powerful than ours.

8. War with either country would probably entail war with the other at the same time.

9. War with both countries would cause the overwhelming defeat of the United States and the payment of enormous indemnities to both countries.

10. *The probability of this occurring within the next ten year, unless the United States builds a navy able to fight both, is so great, and the resulting expense, both in the war itself and in the succeeding indemnities, would be so crushing, that it*

would be good business to follow Great Britain's successful policy, and build a navy equal to hers.

11. We must not be content with merely building big ships and big guns. We must ransack the resources of science, to make the material as efficient as possible: and we must develop in the personnel, first the same heroic qualities which have animated the sea warriors of the past; and, second, that skill in strategy, tactics and engineering which will direct the mechanical power of the material to the most effective use.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A FILING SYSTEM FOR NAVAL VESSELS.

By Lieut. Paul Foley, U. S. Navy.

Editor's Note.—This paper has been examined by the specialists of one of the leading filing firms in the United States, and the systems described pronounced by them to be in accord with the most advanced commercial practice.

The extent to which vertical filing and card indexing systems have invaded the entire commercial world is sufficiently well known to naval officers generally to render unnecessary any extended argument tending to prove that the introduction of such systems on board vessels of our navy will not only add materially to their efficiency, but that, in view of the enormous complements of present-day ships, with their attendant administrative problems, and of property accounts aggregating millions of dollars, the introduction of such systems has become a military necessity.

On one hand, civilian experts familiar with the mechanical details of filing cannot possibly have any thorough knowledge of the technical questions involved, and have passed the navy by for the reason that it is a fundamental filing principle that systems must be adapted to conform with requirements, rather than requirements to mechanical systems. On the other hand, naval officers have neither time nor opportunity to investigate the offerings of the filing market, and, attempting it, find themselves bewildered by its terminology, and adrift in a sea of material useful to railroads, churches, gas companies, doctors, dentists and drummers, but hardly adapted to ships.

An attempt is herein made to reconcile these contradictory conditions, and to outline the problem step by step, as it has developed on one ship during a period of three years.

The printed form which cards assume is, however, a matter of minor importance. With one or two exceptions all herein illustrated have originated in a ship's printing office. The essential things are furniture, folders, guides and cards, sizes, colors and tabs, and how to use them; how to substitute card records for book records, and how to file information so that it can be *recovered.* This is what this system *does,* and what current systems *do not do.*

It is easy enough to devise a file that an individual can understand, but to devise one that others understand is a different matter, although it is the first step in that business reform which the Congress of the United States has made a special appropriation to effect, and to which the Navy Department is committed.

By means of the systems described under General Storekeeping, the entire property account of a battleship, equipage and supplies, in all departments, with all attendant vouchers, can be preserved and administered with the accuracy of a banking establishment and independent of the personality of any individual, in cabinets whose over-all dimensions are 60 inches high and 40 inches wide. This statement is based on actual experience.

FURNITURE.

Horizontal unit filing cabinets are in general best adapted to ships' use.

THE HORIZONTAL UNIT IDEA.

Each unit fits any other unit.

Any single unit, with base and top or cornice, forms a complete cabinet.

Any number or combination of units may be brought together into one unit.

ITS ADVANTAGES.

1. *Gradual Growth.*—A vessel may begin with the smallest cabinet, a single unit, and add to this a section at a time as more capacity is needed.

2. *Much in Little.*—The greatest possible variety of filing capacity can be obtained in the smallest space.

3. *Flexibility.*—The cabinet or stack may be arranged in practically any form desired. Where deck space is limited it may be kept one unit wide, and extend to the ceiling; or it may be arranged in various heights to fit the position of air ports, doors, etc.

4. *Rearrangement.*—As a commission progresses it is often an immense convenience to divide the general file for use in different departments. The horizontal unit cabinet can be arranged to fix existing conditions at any time.

5. *Economy of Space.*—The construction of each unit leaves not an inch of waste space.

All units are one standard width, 38 5-16 inches.

Until such time at least as practice has shaped itself along standard lines it would not seem to be to the interest of the government to undertake the manufacture of filing cabinets in its own navy yards.

Not only is it improbable that it would materially improve in workmanship, but it certainly could not improve on the cost or rapid production of the standard commercial units here illustrated and recommended. These are:

For 3 x 5 cards:

Six-Tray Card Index Unit.—For 3 x 5 in. cards; 4 11-16 in. high, 16 in. deep, outside. Capacity, 7200 light-weight cards with guides.

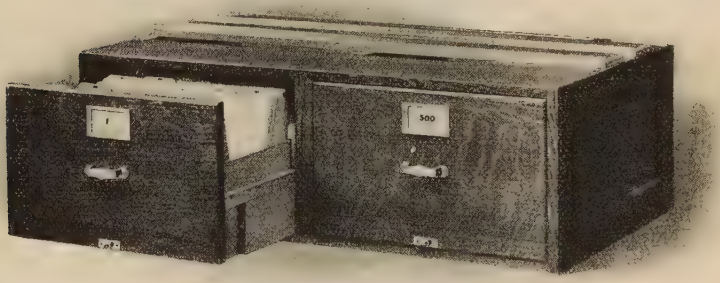
For 5 x 8 cards:

Eight-Tray Card Index Unit.—For 5 x 8 in. cards; 13 in. high, 16 in. deep, outside. Capacity, 9600 light-weight cards with guides.

For new style (booklet) enlistment record:

Six-Tray Check File or Voucher Unit.—Capacity approximately 21,000 checks or vouchers. 11½ in. high, 16 in. deep, outside. Inside size of trays, 10 in. wide, 4¾ in. high, 14 in. deep.

For all correspondence, enlistment record (old style), requisitions, surveys and, in short, all vouchers used in the naval establishment:



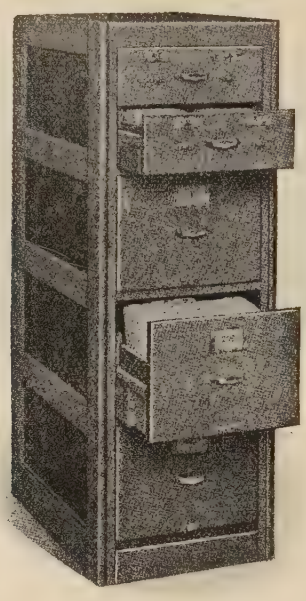
Two-Drawer Legal File Unit.—Capacity of each drawer, approximately 250 folders with legal papers, correspondence and guides. 12½ in. high, 24 in. deep, outside. Inside size of drawers, 15¼ in. wide, 10 7-16 in. high, 22 in. deep.

For the filing of Naval Supply Fund stock cards (special cards hereinafter described):

With Card Index Trays.—Size and capacity same as above, with three trays for 3 x 5 in. cards. Capacity of trays, 3600 light-weight cards with guides.

For the particular use of individual officers, staff, ordnance, etc., for whom no special office is provided, and who nevertheless conduct a correspondence more or less extensive, a vertical legal

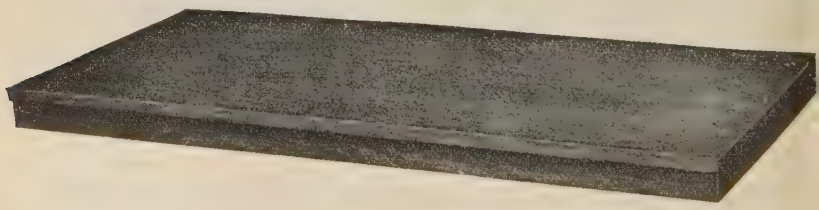
file and card index combination, such as illustrated below, is recommended:



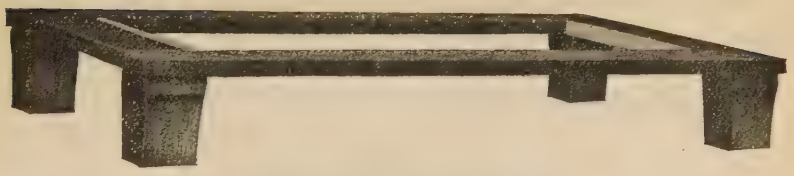
Correspondence File and Card Index Combination.—Two double drawers for either standard 33 size or 3 x 5 in. cards. Capacity, 8000 cards with guides. Three-drawer correspondence file. Capacity, 15,000 letters in folders with guides. Outside width, without ends, 15⅞ in.

Important.

All the horizontal sections illustrated are incomplete without "cornice units" and "base units." All units are one standard width, 38 5-16 inches.



Top or Cornice Units.—2 in. high. Fits any 16 in. deep unit. Total depth, including overhang of cornice, 17 1-16 in.



Low-Leg Base Unit.—17½ in. high, 16 in. deep.

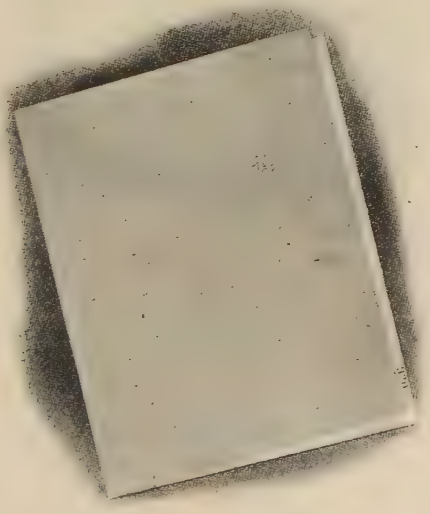
STATIONERY.

The stationery equipment of the foregoing cabinets includes:

Folders, legal and correspondence.
Guides, assorted sizes and types.
Cards, assorted sizes.

Folders.

Folders are simply open-ended envelopes in which papers may be filed on edge instead of flat, whence the term vertical filing.



All folders have a back edge projecting a half inch on which number, name or subject may be entered. When the back projecting edge extends only half across the width the folder is said to be "half cut." Such folders are filed alternately left and

right. By reversing a folder, turning it inside out, a right folder becomes a left and vice versa.

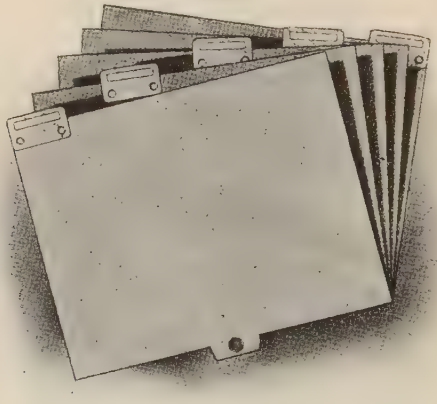
Folders are required and may be obtained in four colors, *manila, blue, salmon and yellow.*

Guides.

Guides are partitions used to separate and classify correspondence. The best and most durable type for the heavy duty required are:

Metal Tip Guides.

They are one of the best new developments in the vertical filing equipment. There is no practical limit to their durability. All



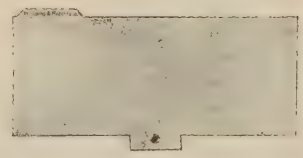
guides wear out on the tabs, which become soiled and illegible and dog-eared. The metal tip guide cannot wear out because the tip is metal.

The metal tip guide is entirely rigid and supports the folders or papers in the file, keeping them compact, erect and in alignment. This stiffness also facilitates reference, making the guide useful in "throwing" the contents of the file forward or backward in consultation.

One of the most important features of all is that the guide heading of the metal tip can be changed at any time: merely insert a new slip in the metal tip. This means that as the file

expands the guiding can be adjusted with the least possible expense.

Metal tip guides are furnished with five widths of projections, of which the single, the one-third and one-fifth are particularly useful for naval use.



They are required in three sizes:

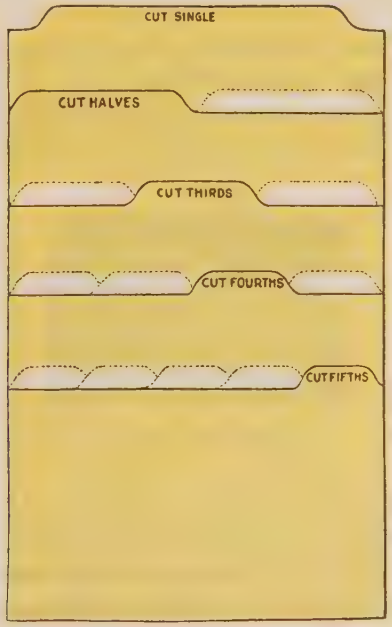
Legal, for folders 10 inches by 15⅞ inches.

Correspondence, for folders 9½ inches by 11 13-16 inches.

Check Sorter, for booklets 4½ inches by 10 inches.

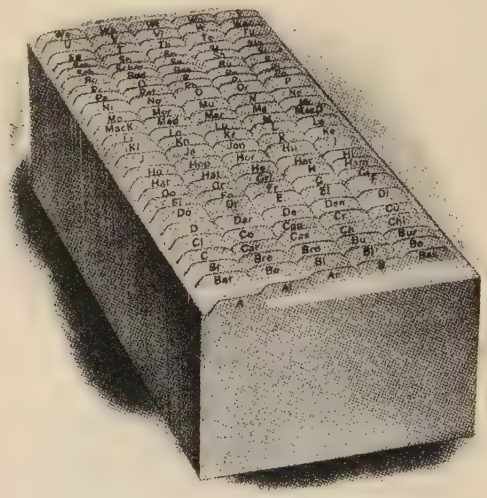
CARD INDEX GUIDES.

In the 5 x 8 and 3 x 5 inch sizes a miscellaneous assortment of blank guides single, half cut, third cut and fifth cut, as shown in the illustration, are required.



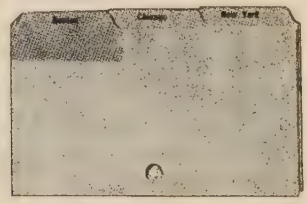
Blank guides.

Guides labeled alphabetically, numerically, monthly and yearly, are required in both sizes, and in three colors, buff, blue and salmon.



A-Z guides. 125 subdivisions of alphabet.

Blank guides may be labeled on board ship by means of the ordinary rubber-type outfits furnished pay departments. They should be stamped on both sides, as by doing so they become interchangeable, right or left, simply by reversal.



Celluloided Guide.

A yeoman of average capacity should be able to set up and stamp in rubber type twenty-five guides or folders per hour.

Stock alphabetical guides are required in the 25, 55 and 250 subdivision sets. A few sets of daily, weekly and monthly guides

are also useful. For all such the type known as "celluloid" is the best on the market. They are unsurpassed for durability, cleanliness and ease of handling.

After the guide is printed a sheet of celluloid is folded over the edge of the guide projection front and back, and firmly cemented.

On this reinforced projection comes all the wear of the guide. It cannot become dog-eared or soiled and adds a rigidity to the guide which facilitates handing to a marked degree. In a permanent card record it is by far the cheapest guide in the end.

INDEX CARDS.

For the various special conditions that develop in the course of filing, horizontal ruled cards in the 3 x 5 and 5 x 8 size may be obtained in six different colors: White, buff, blue, salmon, green, fawn.

The color variety is particularly useful in printing labels for use with metal tip guides. By varying the label color it is possible to get all the advantages of separate color cards.

NAVAL FILING SYSTEMS.

Having outlined the mechanical equipment used in modern filing, follow the particular application of such equipment to shipboard requirements, beginning with

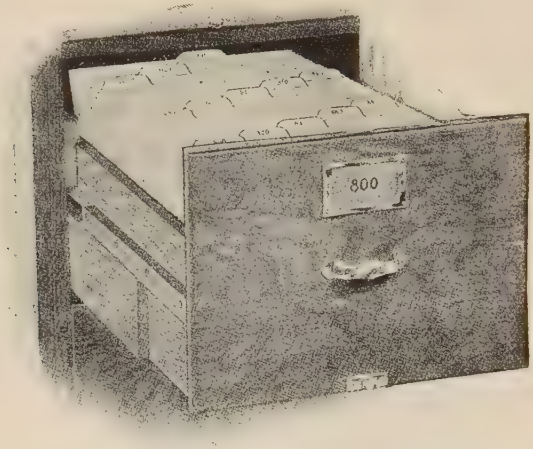
The Captain's Office.

All correspondence of any kind, official or unofficial, is filed in one continuous file, a "numeric file." This file, although described for the captain's office, is equally applicable to the filing of any kind of correspondence whatever, from that of an individual to that of a flagship.

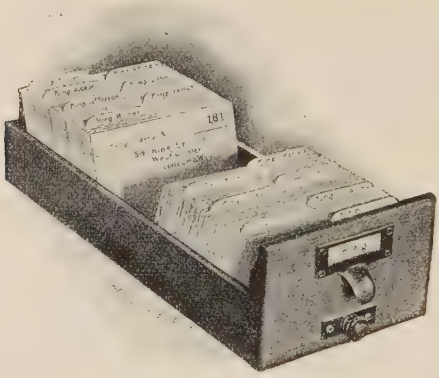
Numerical Filing.

It is the most practical and scientific and most widely used. It simplifies the most complicated correspondence, and insures absolute accuracy and quickest reference.

Tough manila folders of uniform size are numbered from one upward and filed consecutively. In each folder all the letters to



and from one correspondent or concerning one subject are placed in order of date, those of the latest date in front.



Alphabetic card index. Gives instant reference, by number of folder, to any correspondence filed.

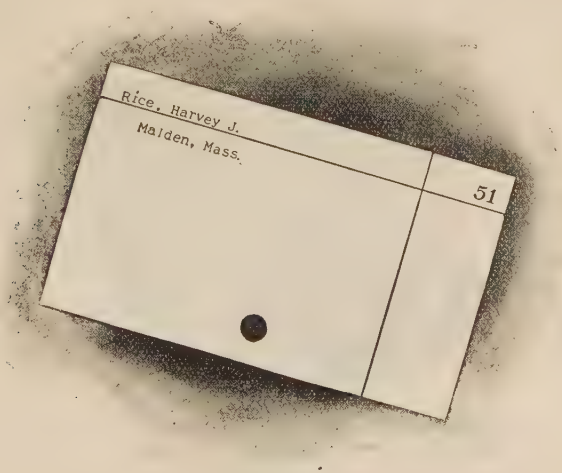
Every letter received and copy of every letter sent are marked with the number of that correspondent's folder, and the yeoman who files goes simply by the number. There is no chance for guess work or error.

The Card Index.

The index to correspondence is kept in a card index. One card is made out for each correspondent or subject, bearing name and address, and the number of that correspondent's or subject's folder. This card is filed in an index tray alphabetically.

To find the number of folder containing any desired correspondence refer to index card.

The index card once made out, indexes a correspondent or subject forever.



Index card. Carries name and address of correspondent or subject, and number of foider. Other data if desired.

When the subject of filing ship's correspondence was first investigated, a system of classification by bureaus of the Navy Department was adopted. The theory of such classification was excellent, but in practice did not work. The following example will illustrate why:

The pay officer of a ship addressed a letter to the commanding officer asking that two additional electric bake ovens be purchased. Appended to the letter were letters from the various manufacturers of this article.

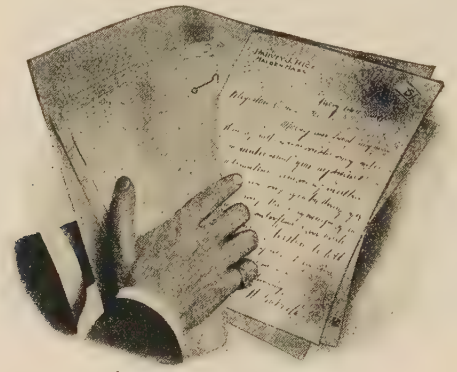
The commanding officer approved of the purchase, and addressed a separate letter to the chief of Bureau of Equipment,

asking that the requisition be approved. To this letter was appended the letter from the pay officer.

The chief of Bureau of Equipment referred the matter to the Bureau of Supplies and Accounts, and in addition wrote for additional data concerning the ovens.

The chief of Bureau of Supplies and Accounts placed an endorsement on the original letter, and wrote the commanding officer direct, asking for other information.

The commanding officer replied to the Bureaus of Equipment and Supplies and Accounts—the one by an endorsement on the original letter; the other by a letter direct.



Letters and answers are filed in folder in order of date.

Equipment also referred the letter to Navigation, which reference resulted in an endorsement and a letter.

The pay officer furnished the commanding officer with all additional information required, which information was forwarded to the respective bureaus under separate covers.

The original letter was finally returned, scarred almost beyond recognition, approved—the pay officer being directed to purchase the two ovens, which had been asked for about three months previously.

The pay officer ordered the two ovens from the General Electric Co.; but received a letter from them stating that they could no longer furnish ovens at the price quoted several months previously.

Letters were exchanged between the pay officer, commanding officer, the Bureau of Equipment, Bureau of Supplies and Ac-

counts and Navigation, and finally the estimated cost was increased enough to allow of the purchase being made.

The matter having been arranged satisfactorily, and the bake ovens being on board, the captain's yeoman proceeds to sort out this correspondence and files it away. He finds that he has correspondence with Navigation, Equipment, C. & R., S. & A., and much general correspondence.

By bureau filing it would be practically impossible to ever relocate this correspondence. By numeric filing it is very simple. All the correspondence is sorted and arranged according to date, and is placed in *one* folder. The procedure is as follows:

1st. The subject of the correspondence is decided to be "Ovens, Electric Bake."

2d. An index card is made out for this subject. Ovens, Electric Bake, is typewritten in the upper left-hand corner of the card; the number of the folder that is to contain the correspondence is placed in the upper right-hand corner of the card; in the lower left-hand corner is written the name of the classification of the letter.

3d. In order that anyone unfamiliar with the correspondence may be able to locate it, the cards are now cross-indexed, and cards are made out as above with the following subjects:

a. Bake ovens, electric.
b. Electric bake ovens.
c. General Electric Co.
d. Westinghouse Electric Co.

The last two references are necessary because several letters concerning the purchase of the ovens had been received from these firms, and different members of these firms had signed their names to them, so that no one would be likely to recall the names of the writers after several weeks had elapsed.

4th. A folder is selected, and the subject of the correspondence is placed thereon: Ovens, Electric Bake. In this connection, it is desirable to make a neat appearance of the folder. This is best done by setting up type for each subject, and stamping it on the folder.

5th. The consecutive number of the folder is now stamped on it, and typewritten on each index card referring thereto.

6th. In order to facilitate replacing correspondence in the proper folders when much correspondence has been taken out, the number of the folder and the class of correspondence to which each letter belongs is typewritten on the top of each letter before it is filed away.

7th. Should there be correspondence concerning other kinds of bake ovens, steam for example, it should be placed in a separate folder, and have separate index cards referring thereto.

8th. In order to facilitate rapid reference, in case this correspondence is desired at the same time as the rest, each index card should be cross-indexed. Thus, if the correspondence concerning the steam bake ovens is to be placed in Folder No. 26, there should appear on the index cards for the Electric Bake Ovens the following reference:

SEE GENERAL CORRESPONDENCE FOLDER NO. 26.

And on that corresponding to the Steam Oven Folder the following:

SEE GENERAL CORRESPONDENCE FOLDER NO. 51.

These directions may appear very complex, but in reality they boil down and make the whole very simple, as shown by the Index Card concerning Ovens, Electric Bake:

INDEX CARD—SIZE 3 x 5 inches.

Ovens, Electric Bake. #51
See Gen. Cor. Fol. #26.
General Correspondence

Alphabetical File.

SAILING ORDERS.

For the filing of sailing orders an Alphabetical File is a convenient help. The Alphabetical File differs from the Numerical File only in that the guides are alphabetical. It eliminates the card index, but is not susceptible to cross reference.

One folder is used for each *place,* in it being placed all orders to that place, and all telegrams from the commanding officer reporting arrival at or departure from that place. For example:

Orders are received at Hampton Roads to Kingston, N. Y.

These orders are filed in a folder, marked "Kingston, N. Y."

The telegrams to the Department reporting sailing from Hampton Roads for Kingston, and the reporting of arrival at the latter place, are filed in the "Kingston, N. Y." folder.

An order from the Department to remain at a place is consid-

ered a sailing order, and would be filed as follows: "Remain Colon." Index Card filed in the C's.

Orders giving an itinerary including more than one place are copied, and one copy of the order is placed in each folder of the places referred to. The original order being placed in the folder of the place first visited.

Upon the arrival of a ship at a place, there is in general much to be attended to, and relating to this are many papers. In order that no matter may be neglected, as might be the case should the commanding officer not keep a pocket file, all letters and papers relating to what is to be done at the next port of call are placed in one folder, marked "Next Port," regardless of the subject matter, and as soon as any one of the matters referred to is completed, the letter or paper is replaced in its proper folder.

This folder, it will be understood, is not a permanent folder, but temporary instead, and is used merely to afford a means of checking up what is to be done and what has been done.

Letters Sent.

In order to keep an accurate record of all letters sent from the commanding officer's office, and also for purposes of reference, all letters are numbered consecutively, regardless of who writes them, the initials of the writer being prefixed to show who is the author.

Each letter is assigned a card, showing the number of the letter, the writer, the date the letter was written, to whom it was addressed and the subject matter. Thus:

Date: January 1, 1910 DGC-1

To Secretary of the Navy,
Bureau of C & R

Subject: Ovens, electric bake,
Increase cost of

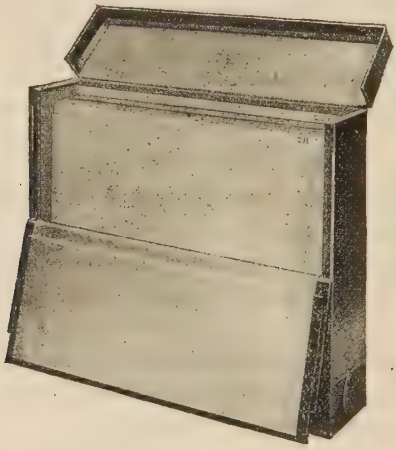
The above form shows that on January 1, 1910, clerk DGC wrote a letter, No. 1, for the commanding officer to the Secre-

tary of the Navy, through the Bureau of Construction and Repair, concerning the increased cost of the Electric Bake Ovens.

These cards are filed behind numerical guides. They do not refer to any folder, but are merely intended to give a ready means of checking up any particular letter about which there may be some question.

Transferring Correspondence.

Let the current file run for whatever fixed period is convenient, a quarter, two quarters or a fiscal or calendar year, then go through the folders and transfer all matter more than the selected date back. Place this transferred correspondence in folders in



Transfer box.

transfer boxes, labeling each box with the number of the first folder which it contains; the first only; for instance 21.

This leaves one period's correspondence in the current file.

At the end of another period repeat the operation, combining the correspondence from each folder transferred with the correspondence from the folder which has been previously transferred. This method repeated on every transfer collects the papers on any subject, or to and from any correspondent, in one place in the transfer box, making it as easy to refer back five years as one, and after dates of individual letters have been forgotten. The importance of this point cannot be too strongly

emphasized. There is always only one place in the transfer file to look for given transferred correspondence.

This method is flexible and absolutely expansive without limit. Should a transfer box become too crowded after several transfers are made to it, another box may be put on the shelf next to it, and the folders in the first box distributed in the two boxes.

For instance, suppose a transfer box contains ten folders, beginning with the folder 190; the box is labeled "190," when this box becomes too crowded take out five of the folders and put them in another box, which is inserted next to the first box. Number the new box "195," being the number of the first folder it contains. By this method the label on the box is never changed.

Note also that the transferred correspondence with its possibility of indefinite expansion takes only the space necessary for the present size.

It is not necessary that the work of transferring be done all at once—yeoman can transfer gradually at odd times.

Reference to the transferred files is reduced to a minimum since current matter remains for a reasonable time back in the current file. The numbers of folders are alike. The card index continues the same; there are but two places to look; this for all time.

GENERAL STOREKEEPING.

The entire work of the centralized General Storekeeping Establishment distributes itself under the following heads:

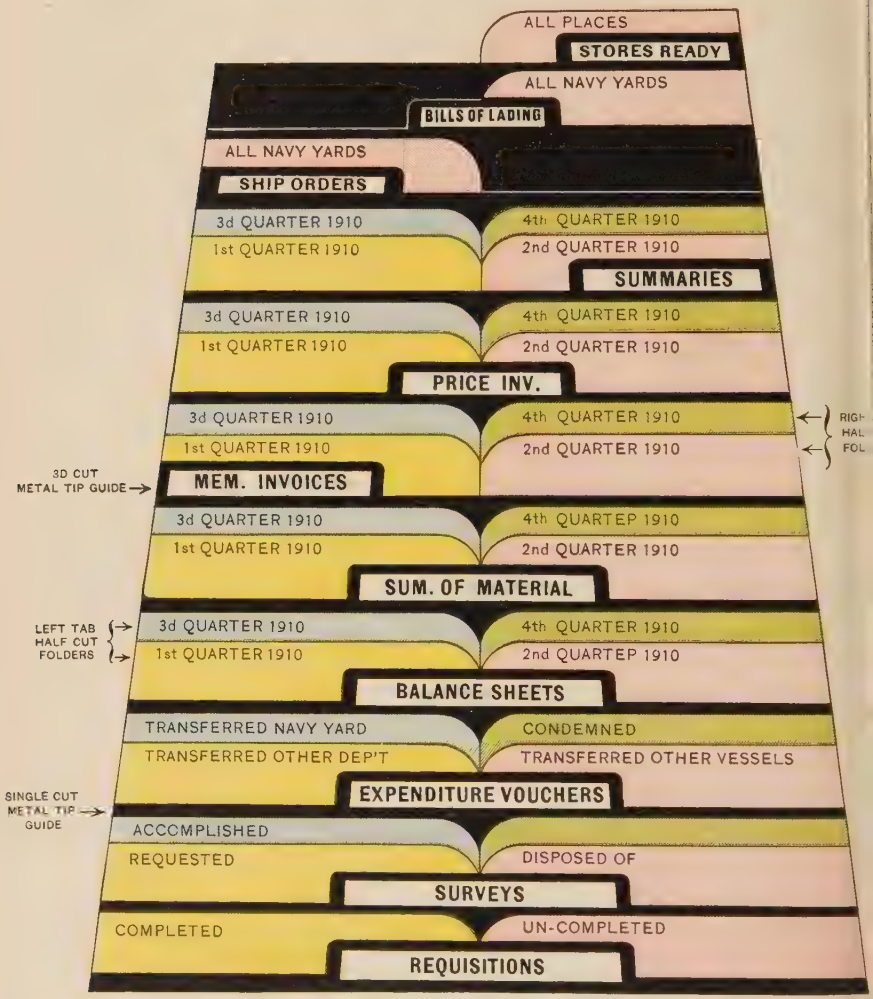
1. General file papers all departments.
2. Naval supply account.
3. Equipage account.
4. Orders on purchasing officer.
5. Receipts from purchasing officer.

Providing for these, it follows that the problem is simplified, even solved, at once.

Vouchers.

The vouchers pertaining to each bureau of the Navy Department are filed in legal cap folders behind special guides, as illustrated in the diagram, Form 1.

Use a separate drawer for each bureau of the Navy Department.



Form 1.

PERSPECTIVE VIEW OF ARRANGEMENT OF DRAWERS, GENERAL STOREKEEPING VOUCHERS.

Catalogue No. 9072 — Normal Stock 3000 Kg.

Class No. 52 — LEAD, WHITE, IN OIL. (NAME OF ITEM) — Locker No. 230

RECEIPTS								EXPENDITURES								BALANCE	
DATE	INV. NO.	FROM	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLLARS CTS.	AV'GE PRICE	DATE	STUB NO.	VESSEL	DEPT.	QUANTITY	UNIT	UNIT PRICE	AMOUNT DOLS. CTS.	QUANTITY	AMOUNT DOLLARS CTS.
5-7-10	1950	Charleston	3000	Lb	.07	210—		5-28-10	957	Lamson	Cost	100	Lb	.07	7—	7900	203—
								5-23-10	774	Smith	"	150	"	.07	10 50	7750	192 50
								5-24-10	787	Filmer	"	100	"	.07	7—	7650	185 50
								5-24-10	843	Dixie	"	600	"	.07	42—	7050	143 50
								6-15-10	897	Filmer	"	100	"	.07	7—	6950	136 50
								6-14-10	877	Preston	"	50	"	.07	3 50	6900	133—
								6-16-10	925	Lamson	"	100	"	.07	7—	6800	126—
								6-22-10	954	Smith	"	50	"	.07	3 50	6750	122 50
								6-30-10	968	Dixie	"	300	"	.07	21—	6450	101 50
7-19-10	230	Boston	3000	Lb	.0564	169 23		8-1-10	84	Smith	"	200	"	.06102	12 20	5250	320 53
7-19-10	460	"	1000	"	.062	62—	.06403	"	77	Filmer	"	100	"	"	6 10	5150	314 43
								"	113	Reid	"	100	"	"	6 10	5050	308 33
								8-25-10	217	Dixie	"	300	"	"	18 31	4750	290 02
								9-1-10	282	Lamson	"	200	"	"	12 20	4550	277 82
								9-16-10	343	Filmer	"	100	"	"	6 10	4450	271 72
								9-19-10	350	Dixie	"	200	"	"	12 20	4250	259 52
								9-21-10	455	Smith	"	200	"	"	12 20	4050	247 32
10-19-10	8605	New York	1000	Lb	.057	57—		10-31-10	463	Dixie	"	450	"	.0639	28 76	8600	549 56
10-28-10	10030	" "	4000	"	.0668	267 20	.0639	11-15-10	509	Preston	"	200	"	"	12 78	8400	536 78
								11-26-10	554	Filmer	"	100	"	"	6 39	8300	530 39

BALANCE CARRIED FORWARD

FORM 2. (Reduced Size.)

The vouchers filed in this way include:

Requisitions.
Surveys.
Expenditure Vouchers.
Balance Sheets, Quarterly.
Summaries of Material, Title "Y."
Memorandum Invoices.
Price Invoices.
Store Summaries.
Shipment Orders.
Bills of Lading.
Notices of Stores Ready for Delivery.

The filing diagram is believed to be self-explanatory.

Office Correspondence.

File the correspondence of the office other than the property account vouchers in an ordinary numerical vertical file with card index.

General Account Advances.

NAVAL SUPPLY FUND, TITLE "Y."

For each item of stock carried under this account provide a card, *correspondence* size, 9½ x 11 13/16 inches, as shown in special Form 2.

These forms are ruled alike on both sides.

File them behind *numerical class guides,* with additional alphabetical guides in classes *12, 13, 17, 41, 42, 45, 52, 53* and *54.*

Upon superficial examination this stock card might appear to be only a card. A closer examination, however, will reveal that it shows:

1. *The "class" of the item.*
2. *Its catalogue number in accordance with a special reference catalogue arranged as per following sample page:*

G	Article.	Class.	Unit.	Price.	Remarks.
G-53	Graphite, Plumbago.	52	Lb.	.14	Flake in 5 lb. tins.
G-54	Grease, Albany.	14	Lb.	.075	In 5 and 25 lb. tins.
G-55	Grommets, brass, No. 3.	42	Gro.	.97	Sailmakers' grommets for canvas in 1 gross boxes.
G-56	Grommets, Spur, No. 2.	42	Gro.	.97	
G-57	Grommets, Spur, No. 3.	42	Gro.	.97	
G-58	Grommets, Spur, No. 4.	42	Gro.	.97	
G-59	Grommets, gage glass, ½.	33	Doz.	.08	
G-60	Grommets, gage glass, ⅝.	33	Doz.	.08	
G-61	Grommets, gage glass, ¾.	33	Doz.	.08	
G-62	Guards, Type A.	17	No.	1.20	Electrical fitting for steam tight globes.
G-63	Gum, Camphor.	51	Lb.	.60	In 1 lb. rectangular cakes.
G-64	Gum, Strip, ⅜x$\frac{5}{16}$.	33	Lb.	.80	Rubber, in lengths of 12 feet.
G-65	Gum, Strip, ⅝x$\frac{5}{16}$.	33	Lb.	.80	
G-66	Gum, Strip, ⅝x¾.	33	Lb.	.50	
G-67	Gum, Strip, ¾x½.	33	Lb.	.80	
G-68	Gum, Strip, ¾x¾.	33	Lb.	.75	
G-69	Gasoline.	8	Gal.	.21	In 5 gal. tins and 50 gal. drums.

3. The normal quantity carried.

4. Where stowed in the ship.

5. The rate of issue for any period.

6. Balance for quantity or value or both at any time.

Record of Stub Requisitions.

File all stub requisitions for each bureau in the drawer containing the vouchers of that bureau. Use a single-cut guide labeled *stub requisitions,* with folders labeled *1st, 2d, 3d and 4th quarter,* as for the other vouchers.

This special label is not shown in the diagram.

Money Allowance.

When vessels are operating on a money allowance the state of the account from day to day can be kept on the special form card No. 3.

File these in the voucher drawer behind a single guide labeled *money account.*

Certain items of stock carried under the Naval Supply Fund, oil for example, are not properly charged against the money allowance. It might readily happen, however, that a stub requisition would contain such an item among others that are properly charged against the account. To meet this condition, charge against the account the full face value of the stub, and credit the

U. S. S. ---------- Serial No. for Ship. 7

1910		Amount Credited	Amount				Date		Charged	Invoic No.	Amt.				
July	1	Allowance for 6 months			7	65	—	July	1	On hand by inventory			8	44	88
July	31	By Special Order #10				34	80	July	31	Drawn from G.S.K., "Dixie"				34	80
Aug	31	Do			7	70	—	Aug	31	Do.			8	44	99
Sept	30	Do					54	Sept	30	Do				35	81
Oct	1	Turned into store by expenditure #10				17	36	Aug	17	By C.B. #87 (Hay Leo)				2	—
								Oct	31	Drawn from G.S.K., Norfolk, Va., Inv. nos. 3827, 3861, 3847, 4076, 4077, 4075, 4700, 4702, 4703, 4395, 3716, 3813, 3788, 3978, 4701, 4771, 4769, 3698, 4085, 4078, 4479, 4578, 4109, 4090, 4519, 2809, 3639, 3794, 4704, 3787, and 4112.					
Oct	31	By Special Orders #10, Inv. nos. 3698, 4085, 4078, 4479, & 3787 (7 items). Total			19	27	75			Total				521	39
Nov	30	By Special Order #10				59	79	Nov.	30	From G.S.K. "Dixie"				37	73
		Total Credit.		33	39	24				Total.			29	27	80
		Total Charged.		29	27	80									

account with the value of the excepted article. The balance will always be correct.

Orders for Purchasing Office.

Under the new organization the pay officer of the ship is in effect a purchasing agent and as such prepares all requisitions.

Every department of the ship is supplied with other cards similar in form to that of special Form 5 on which it makes its orders on the pay office. When it is necessary to use technical description in the preparation of requisitions, such description is entered on the card by the technical expert.

When the requisition has been prepared according to the card data given, the general storekeeper's responsibility ends.

File these cards behind numerical guides by departments.

Record of Receipts.

A form similar to that shown in special Form No. 6 is used to notify the ship departments of the receipt of material.

File these receipts behind numerical guides by departments.

Equipage, Title "B."

File the itemized inventory of equipage for each department of the ship on individual cards, 3 x 5, ruled as per special form No. 7.

One side of this card covers *receipts,* the other side covers *expenditures.*

File these cards alphabetically by departments behind *numerical class guides.*

Custody Receipts.

Custody receipts, Form 8, shown front and reverse, are filed wherever necessary behind the item card pertaining thereto.

Req. No.

Required in Steam Eng **Dept.** Date 8/17/09 191

Quantity	Description	Estimated Cost
No 4	1 Klinger Reflex Water Gauges #7 complete, with spare glasses for each.	$100.00

Special purpose required: To replace present installation double Scotch glasses on main boilers.

Order from firm: Ferguson Mfg Co — Boston Mass

Proprietory Article (Yes, no)	Wanted by what date
Yes	9/1/10

Submitted by: P. Melcher Chief.

Approved: H. L. G. , U. S. Navy, Head of department.

OFFICE GENERAL STOREKEEPER, U. S. S. Up-to-date

The following material has been received from Ferguson Mfg Co for the S. Eng Dept.

Quantity		Description.
No	4	1 Klinger Reflex Glasses, complete with spare glasses

If there is a criticism of the material mark a cross here.....and report on back of this slip.

John Smith P.A. Pay U.S.N.

General Storekeeper.

FORM 6.

Name of Item PISTOL, VERYS' NIGHT SIGNAL.

Class No. 12 Title B Dept. Construction & Repai

RECEIPTS

Date	Invoice No.	Where From	Unit	Quantity	Unit Price	Amount
8/10	3380	New York, N.Y.	No	1		12 4
8/21	2354	Boston, Mass.	"	1		12 3
				Over		

Form 7, Front.

Name of Item PISTOL, VERYS' NIGHT SIGNAL.

EXPENDITURES

Date	Invoice No.	Disposition and Authority	Unit	Quantity	Unit Price	Amount
9/21	7	Survey, store, Norfolk, Va.	No	1		12 4

Form 7, Back.

CUSTODY RECEIPT

te June 23, 1910 Name of Item 2 GAUGES, KLINGER, #B-7

Received from General Storekeeper, U. S. S. Dixie, the following items of equipage for

se on board in the Steam Engineering Department.

W_____ H_____, Ensign U. S. Navy

(Over). Engineer Officer

FORM 8, FRONT.

sponsible for this item (Name) J_____ N_____, C.M.M., U.S.N.
(Rate)

ere used, and purpose Fireroom for water gauges of main boilers, #7 & 8.

J. J. Carey, C.W. Tenley

FORM 8, BACK.

THE EXECUTIVE OFFICER'S OFFICE.

This is a system designed to afford a convenient classification:

1. *Of the ship's station bills and office correspondence.*
2. *Of all records of the enlisted personnel.*
3. *To make the complete status of the office business apparent at a glance to the executive officer's temporary successor, and to make such information independent of any yeoman.*

1. Correspondence: Station Bills.—Regulations Internal Discipline.

File all such in a numerical file with card index, precisely similar to that described for the captain's office. Among the characteristic papers that will find their way to such a file are smooth copies of the following:

Fire Bill.
Collision Bill.
General Quarter Bill.
Rescue Party.
Messing Bill.
Berthing Bill.
Abandon Ship.
Miscellaneous Orders.
Directory of Office.
Boat Bill.
Man Overboard.
Load and Draft.
Letters Transferred Men.
Quarterly Marks.
Rewards Offered.
Mess Statements.
Weekly Allowance Cleaning Gear.
Transportation Requests.

2. Enlistment Records.

File the old-style enlistment records flat on edge in legal size folders, assigning one record to each folder. File the folders behind *alphabetical guides.*

File all telegrams, requests or miscellaneous information of any kind relating to any enlisted man in the folder with his record. The production of the record then brings with it every paper of interest in connection with the person concerned.

One man of a ship's company preferred a request for leave for the purpose of visiting his parents: natural request, except that

on file with his record was found a telegram, dated a year before, announcing the death of his mother.

The new type (book) enlistment records may be filed in the same folders as the old type; or they may be filed *without folders* behind *check sorter* guides, in a separate cabinet which we have illustrated.

Such filing is not recommended, however, as it prevents the preservation in convenient form of the individual literature before referred to.

Alphabetical List of Crew.

Muster Roll—Conduct Book.

An ALPHABETICAL LIST *of the crew, irrespective of rating,* is required; for use in connection with the preparation of the quarterly *muster roll,* and for the preparation of visiting lists in general.

For this file use cards 5 x 8, as illustrated, filed behind *alphabetical guides,* about 250 to the set for a crew of 900 men.

As a further convenience, use cards of *different colors,* the color indicating the *branch* of the person concerned in accordance with the following table:

Seaman Branch	Salmon.
Artificer Branch	White.
Engine-room Force	Blue.
Special Branch	Buff.
Commissary Branch	Green.
Messmen Branch	Chocolate or fawn.

Complement and Muster Roll of Crew.

This file is designed to facilitate the preparation of the *weekly report of vacancies;* also for conducting at any time a *general muster of crew.*

It is essentially a file of guides; single-cut and half-cut guides being used, varied in color as convenience suggests.

Name: Mc Vey, Thomas Albert (Full name, surname to the left)

Rate:

Enlisted Oct. 21, 1908, I

at Buffalo N.Y., to serve

{four years from date. / ~~during minority, until~~}, I

Previous naval service, about 4 years.

Holds C. S. C. No. 24648

Holds G. C. medals, None. (Number)

Trade, Piano Polisher

*Citizenship, U. S.

Place of birth, Binghampton N.Y.

Date, May 28, 1882

Home address: City, #302 Cherry St. Buffalo State N.Y.

Name and address of next of kin, (Mother) Mrs. Catherine Mc Vey. same address.

Name and address 1st Beneficiary (Mother) Mrs. Catherine Mc Vey. same address.

Received on board..February 20 1910 From..U. S. S. Lancaster

~~Transferred~~
~~Deserted~~
Di } ..March 31 ..19 10 ..U. S. S. Lawson
(To what vessel or disposition.)

Discharged at.....on account of .....

with.....discharge, this.....day of.....19.....

Furnished transportation and subsistence to.....Total cost, $.....

Gunnery Record,.....Gun Pointer.....Class.....
(Insert H. I. or S. class and date.)

Is recommended for honorable discharge.....? Good conduct medal.....? Reenlistment.....?

Rating Best qualified for.....Health.....

Pay at date of discharge:

Pay per month (pay table),	$.....	.....
Additional for continuous service,	.....	.....
Additional for G. C. medals, Dated..... (Year only.)	.....	.....
Additional for certificate of graduation,	.....	.....
Additional for qualified C. P. O.,	.....	.....
Additional for U. S. citizen reenlisting,	.....	.....
Additional ten per cent,	.....	.....
Additional for detail as,	.....	.....
Total pay per month,	.....	.....

State of account at date of .....

FORM 9.—ALPHABETICAL CREW, BACK.

The sequence of guides follows that of Bureau of Navigation form 25, weekly report of vacancies.

Begin thus:

No. of guide.	Kind.	Color.	Label.
1.	Single cut	Red	Seaman Branch (150) the number indicating the total of the seaman branch allowed by the complement sheet.
2.	Single cut	Buff	Chief-Master-at-Arms (1) number indicating as before.
3.	Half-cut	Blue	Master-at-Arms 1C (4).
4.	Half-cut	Blue	Master-at-Arms 2C (4).
5.			
6.			

Continue thus: Chief petty officer, *single cut;* all other petty officers and men, *half cut.* Alternate color as required.

Behind each rating guide file cards showing the names of the holders of such rates, each on a separate card. Thus: Behind chief-master-at-arms 1 should be found *one card* bearing a name. Should there be a vacancy, there would be no card, and the fact of the vacancy would be apparent. Should there be one in excess, two cards would be found.

So long as the number stamped on the guide is correct, the number of cards filed is absolutely a measure of the state of the complement.

Repeated Caution.—*Stamp guides in rubber type—both sides of every tab to permit of reversal.*

Labels.

These are most readily printed in the ship's press, on the reverse side of the many different color cards provided.

The most convenient way is to make a tabular list of all labels required of the same size; have them set up in a single chase spaced as required after cutting; and printing in sheets on as many different colored cards as may be at hand.

When labels thus printed are cut up, every label is at hand in every color, and any desired color combination is instantly effected.

Special Details.

The special form of card illustrated is filed behind ½ cut guides, showing *detail*. Thus sample labels would include:

Crew Messmen.
Captain Head.
Captain Hold.
Messengers.
Orderlies.
Signalmen.
Gun-deck Cleaners.
Berth-deck Cleaners.
Splinter-deck Cleaners.
Storeroom Keepers.
Washroom Keepers.
Lamplighter.
Jack-of-Dust.
Mail Clerk.
Tailor.
Steam Launches' Crews.
Printer.

Every man on ship subject to detail has a detail card prepared. When not actually on detail, file his card alphabetically behind a single-cut guide labeled *men not on detail.*

After the expiration of a reasonable period the detail cards show a variety of useful information.

Every file of enlisted personnel should begin with a *marker* showing the *date to which the file is corrected,* and such correction should be made twice weekly. Without this precaution the files soon fall hopelessly behind.

Record of Leave.

A file of 5 x 8 cards, as illustrated, filed behind *alphabetical guides.*

Provide a card for every man in the ship's company.

When the man is not on leave, file his card alphabetically behind a leading guide labeled *men not on leave,* and when he leaves the ship remove the card from the old file, and place it in the file beginning *men on leave.*

After the expiration of a reasonable period the card shows just how much leave the man has had. It becomes impossible for him to come to the "mast" and say "I haven't had leave for ——."

In the event of the vessel sailing unexpectedly it is but a matter of minutes to run through the leave file and notify all absent men of projected movements, for which use a *postal-penalty, stamped,* is all that is required.

NAME: Anderson, A.C.

RATE: F2C

DETAILS

DETAILED AS—	DATE DETAIL	DATE RELIEF	MANNER OF PERFORMING DUTY—WHY RELIEVED
Messman	Feb.4	Feb.28	Satisfactory; Changr in detail
Eng 1st St.	June 17	Mch.5	Satisfactory in work, Unreliable
Relief St.Launch Engineer	Mch.26	May-15-	" " " " Chronic liberty breaker
Wash Room keeper	May-16-10	JuneJu0-10	Satisfactory change in details.
Messman	June-11-10	July-1-10	" " " "
Foreman 2nd Steamer	July 2-10	August-1-10	" " " "

NAME Kelly, D.E. RATE Yeoman 3C

PLACE	DATE	NO. DAYS LEAVE	TRAVEL TIME	DATE REPORT ON BOARD	ADDRESS WHILE ABSENT.
Phila. Pa.	May 25	5	2	June 1	10 Beacon St.
PROVINCETOWN	7/30/09	3	—	8/2/09- ✓	Chelsea, Mass.
Tompkinsville,	9-24-09	3	10:00a.m.-9-27-09		Lynn, Mass. ✓
Boston, Mass	10-22-09	3		10-25-09 noon	" "

FORM 11.—RECORD OF LEAVE, FRONT AND BACK.

Previous Occupations.

An index of this kind is a most valuable aid to eliminate misfits among the crew, one of the most frequent sources of unhappiness, originating from a too literal acceptation of the *trade* given upon enlistment. What really is wanted is a record of every occupation at which the man has previously earned money. Recruits do not understand the wide range of occupations found on board ship.

Having such a file, the executive officer, when he wishes a striker for the barber, finds one under *barber;* or, if he wants a moving picture operator, can find one; or, if he wants an undertaker, may even find that.

File these cards, size 3 x 5, behind special third-cut guides labeled by *trades.*

Individual Liberty Card—Conduct Record.

5 x 8 cards, printed both faces.

No record of liberty is kept except for the men of second, third or fourth class; but the place, date and time of every liberty extended classed men is entered on card. Thus, in the absence of the executive officer or other person controlling the liberty, John Brown, seaman, cannot appear with a telegram, and perhaps represent to the acting executive officer "I'm third class and haven't been ashore for a month." The executive officer consults the file, and verifies his statement at once.

The reverse side of every liberty card contains the record of conduct. This record is of inestimable value in considering special requests of any character. A man might be technically first-class without being entitled to a special privilege, such as being one of a limited number to attend a minstrel show.

If the crew be divided into two liberty parts, cards of three colors will be required:

Starboard Watch	Salmon.
Port Watch	White.
General Parts	Blue.

If the crew be divided into four parts, cards of five colors are required.

The cards of each part are filed behind *alphabetical guides.*

The conduct record of each man is entered on the back of the card.

PLACE	CONDUCT CLASS	BECOMES NEXT CLASS.	COMMENCEMENT OF LEAVE.		EXPIRATION OF LEAVE.		RETURNED.		CONDITION.	INITIALS OF OFFICER OF THE DECK.
			DAY.	HOUR.	DAY.	HOUR.	ON TIME OR BEFORE.	HOURS OVERTIME.		
	2	7-19-								
Rockport			7/3	2:00	7/4	12:00	✓			
PROVINCETOWN	2	7/19/09	7/11	1:00	7/11	10:00				
Newport	4	9/12								
Norfolk Va	3	10/12	9/16	6.00	9/17	8.00	✓			
New York N.Y.			9/24	3.00	9/25	8.00	✓ over			
	2	11/12.								
BOSTON			10/23	1.00	10/25	7:00	✓			
	1	11/12								

General Liberty Section
Wrote
No.

(OVER)

FORM 12.—INDIVIDUAL LIBERTY CARD CLASSED MAN, FRONT.

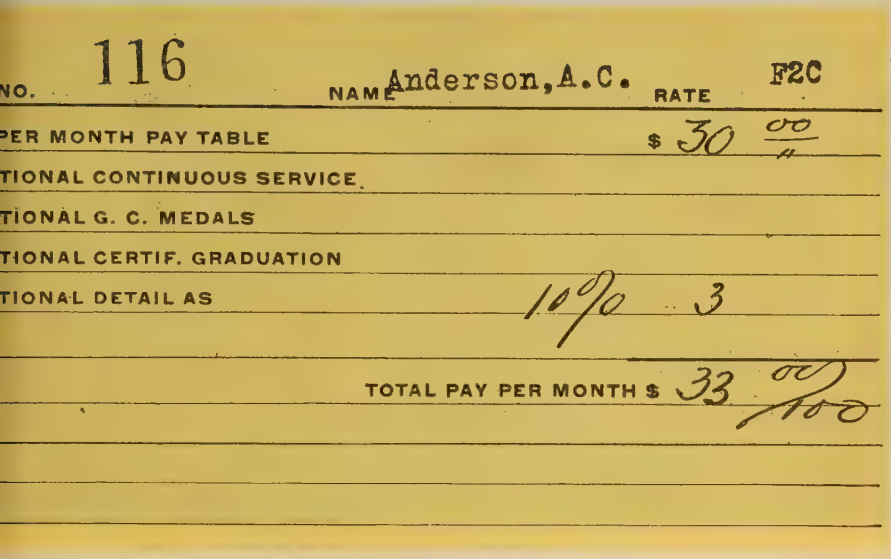
	MERITORIOUS CONDUCT WORTHY OF SPECIAL MENTION. (Note date) OFFENSES OR CAUSE OF DISRATING (Note date)	PUNISHMENTS. (Note the date of issue of appointments and change in rating.)
1	2-8-09. Overleave 62 hrs.	4th class
2	7-09. Overleave 102 "	S.C.M. Sol. conf. 6 d. w. 4 d. loss $7.70
3	4-18-09 " 23½ hrs.	Reduced to 4th class.
4	5-30-09 " 86 "	Der. C. Lose pay amty to $17.60.
5	8-12-09 " 11 days 10 hrs	S.C.M. Sol. conf. 6 d. w. 10 d. etc. to lose $6.00
6	1-30-10 " 89 hrs.	Dk. Cl. Lose pay amty to $22.00
7	3-16-10 " 134 "	S.C.M. Sol. conf. 10 days lose $5.00
8		
9		
10		
11		
12	Reverse Side above card	

(OVER)

In each liberty part drawer single-cut guides or portable colored steel markers divide the whole into conduct classes: *Special, first, second, third, fourth and restricted.*

The liberty list is prepared from the alphabetical part list.

Pay Numbers.


NO. 116 NAME Anderson, A.C. RATE F2C

PER MONTH PAY TABLE $ 30 00

TIONAL CONTINUOUS SERVICE

TIONAL G. C. MEDALS

TIONAL CERTIF. GRADUATION

TIONAL DETAIL AS 10% 3

TOTAL PAY PER MONTH $ 33 00/100

Form 13.—Pay Numbers.

3 x 5 cards, as illustrated in duplicate for each man, one set filed consecutively behind numerical guides, the other set alphabetically behind alphabetical guides.

Home Town.

3 x 5 cards, with the name and rate filed alphabetically behind city guides, the nearest large coast city or port being used as the label. Port guides filed consecutively from north to south.

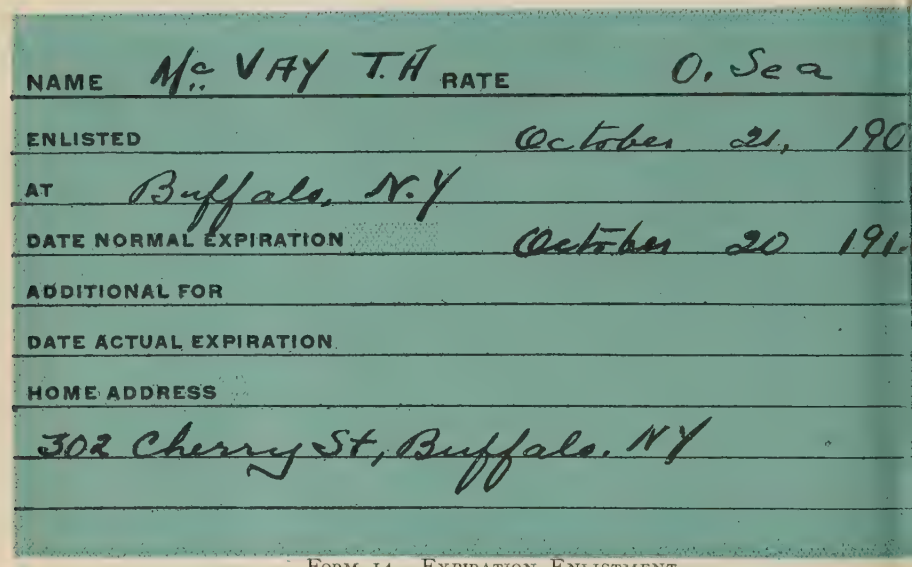
Expiration of Acting Appointment.

3 x 5 cards, filed behind chronological guides, heavy typewriter paper will do.

Continuous Service Certificates.

Are filed alphabetically behind 5 x 8 guides in 5 x 8 cabinet drawers.

Expiration of Enlistment.


NAME Mc VAY T.H RATE O. Sea
ENLISTED October 21, 190
AT Buffalo, N.Y
DATE NORMAL EXPIRATION October 20 191
ADDITIONAL FOR
DATE ACTUAL EXPIRATION
HOME ADDRESS
302 Cherry St, Buffalo, N.Y

Form 14.—Expiration Enlistment.

3 x 5 cards, as illustrated, filed behind chronological guides.

Itemized List of Equipment.

Itemized lists of the furniture and equipment necessary to install filing systems complete, as herein described, in a first-class vessel having a complement of one thousand men, are here appended.

They aggregate one thousand dollars evenly apportioned between the Bureau of Construction, which furnishes the furniture or cabinets proper, and the Bureau of Supplies and Accounts, which furnishes stationery.

Should a miscellaneous assortment of guides, folders and cards be included in the annual stationery contract of that Bureau, the total cost per ship would be reduced considerably.

FOR THE CAPTAIN'S OFFICE.

Furniture.

(Outside width 38 5/16 inches.)

3 Two-drawer legal file units, 24 in. deep, oak, antique finish, without locks. Each $17.00.....Total, $51.00
1 Six-tray card index unit, 3 x 5 cards, 16 in. deep, oak, antique finish, without locks. Each $20.00.....Total, $20.00
1 Cornice unit, oak antique, 16 in. deep.....Each, $3.25
1 Low-leg base unit, 24 in. deep, oak antique.....Each, $3.25

Caution.—In ordering furniture specify outside dimensions of cabinets, 38 5-16 inches.

Stationery.

1000 Folders, *manila,* legal size, standard grade, medium weight, half cut, numbered consecutively 1 to 750 and 250 blank $11.00
100 Guides, metal tip, 1-5 cut, heavy weight, numbered 1 to 100 by tens $9.00
25 Same, alphabetical, 25 to set..... $2.50
100 Numerical guides, for 3 x 5 cards, 1-5 cut, 1 to 1000 by tens, celluloided, *salmon* $2.50
1 Set alphabetical guides, for 3 x 5 cards, 250 to set, celluloided, *salmon* $4.50
4000 Cards, 3 x 5, *white,* commercial No. 1 grade, light weight, correspondence ruling $8.00

GENERAL STOREKEEPING SYSTEM COMPLETE.

Furniture.

(All units 38 5/16 inches wide.)

4 Two-drawer legal file units, 24 in. deep, oak antique finish, without locks. Each $17.00..... $68.00
3 Two-drawer correspondence file units with intermediate storage drawer, 24 in. deep, oak antique finish, without locks. Each $16.00 ..... $48.00
1 Four-drawer card index unit, for 5 x 8 cards, 16 in. oak antique finish, without locks. Each $13.00..... $13.00
3 Six-tray card index units, for 3 x 5 cards, oak antique finish, without locks, 16 in. deep. Each $11.00..... $33.00
2 Cornice units, antique oak, 16 in. deep. Each $3.25..... $6.50
2 Low-leg base units, 24 in. deep, antique finish oak. Each $3.25.. $6.50

Stationery.

Quantity.		
5000	Cards, 3 x 5, *white,* printed both sides as per form 7, commercial No. 1 grade, light weight. No punch	$10.00
2000	Cards, 3 x 5, *salmon,* printed both sides as per form 8, commercial No. 1 grade, light weight. No punch	$6.00
6	Sets, Guides, 3 x 5, commercial one-fifth cut, numbered consecutively from 1 to 65, celluloided, *salmon.* No punch	$9.00
20	Sets, Guides, 3 x 5, alphabetical, 25 to set, celluloided, tabbed, 12 tabs to width, *buff*	$15.00
3000	Card Ledger, cards, correspondence size printed on both sides as per form 2, commercial No. 1 grade	$45.00
2000	Cards, 5 x 8, printed both sides, as per form 3, *white,* commercial No. 1 grade, light weight	$16.00
1000	Cards, 5 x 8, printed on one side as per form 5, *white,* commercial No. 1 grade, light weight	$8.00
1000	Cards, 5 x 8, printed on both sides as per form 16, *salmon,* commercial No. 1 grade, light weight	$10.00
50	Guides, metal tip, single cut, legal size, heavy weight	$5.50
75	Guides, metal tip, third cut, legal size, heavy weight	$8.00
75	Guides, metal tip, fifth cut, legal size, heavy weight	$8.00
50	Guides, metal tip, fifth cut, numbered from 1 to 500 by tens, legal size, heavy weight	$6.00
65	Guides, metal tip, fifth cut, numbered consecutively from 1 to 65, correspondence size, heavy weight	$7.00
8	Sets, Guides, pressboard, heavy alphabetical, 25 to set, correspondence size	$15.00
200	Folders, legal size, half cut, *yellow,* No. 1 grade	$6.00
200	Same, *red*	$6.00
200	Same, *green*	$6.00
200	Same, *manila plain*	$6.00
500	Folders, *manila,* legal size, half cut, numbered consecutively 1 to 400 and 100 blank	$5.00

EXECUTIVE OFFICER'S OFFICE.

Furniture.

4	Two-drawer legal file units, 24 in. deep, antique finish, without locks. Each $17.00	Total, $68.00
8	Four-tray card index units for 5 x 8 cards, antique finish, 16 in. deep, without locks. Each $14.00	Total, $112.00
1	Six-tray check file unit, antique finish, 16 in. deep, without lock. Each $20.00	Total, $20.00

3 Six-tray card index units for 3 x 5 cards, 16 in. deep, antique finish, without locks. Each $11.00.....Total, $33.00
2 Cornice units, antique oak, 16 in. deep. Each $3.25.....Total, $6.50
2 Low-leg base units, 24 in. deep, antique oak. Tach $3.50....Total, $7.00

Stationery.

(All estimates for material are liberal.)

Quantity.

1000 Cards, 5 x 8, *salmon,* light weight, commercial No. 1 grade, Special Ruling U. S. Navy Form No. 9..... $8.00
500 Same, *white* $4.00
1000 Same, *blue* $8.00
500 Same, *buff* $4.00
250 Same, *green* $3.00
250 Same, *fawn* $3.00
1 Set alphabetical guides, for 5 x 8 cards, 250 to set, celluloided, *salmon* $3.00

Complement and Muster Roll.

Quantity.

200 Guides, single cut, blank for 5 x 8 cards, *buff*..... $12.00
200 Same, *blue* $12.00
200 Same, *salmon* $12.00
200 Guides, half cut, blank for 5 x 8 cards, *buff*..... $12.00
200 Same, *blue* $12.00
200 Same, *salmon* $12.00
1500 Cards, 5 x 8, *white,* commercial No. 1 grade correspondence, ruling, light weight..... $12.00

Special Details.

Quantity.

2000 Cards, 5 x 8, *salmon,* commercial No. 1 grade, light weight, Special Ruling U. S. Navy Form 10. Per M..... $16.00
100 Guides, blank, for 5 x 8 cards, half cut, *buff*..... $6.00
1 Set alphabetical guides, for 5 x 8 cards, 250 to set, celluloided.. $7.00
10 Guides, single cut, blank, for 5 x 8 cards, *salmon*..... $1.00

Record of Leave.

Quantity.

2000 Cards, 5 x 8, Special Ruling U. S. Navy Form 11, commercial No. 1 grade, light weight, *blue*..... $16.00
1 Set alphabetical guides, for 5 x 8 cards, 125 to set, celluloided, *salmon* $3.50
1 Set same, *buff*..... $3.50

Individual Liberty Card—Conduct Record.

Quantity.		
1000	Cards, 5 x 8, ruled as per Special Form U. S. Navy No. 12, commercial No. 1 grade, light weight, *salmon*	$8.00
1000	Same, *buff*	$8.00
1000	Same, *blue*	$8.00
	If four liberty parts:	
1000	Same, *white*	$8.00
1000	Same, *fawn*	$8.00
4	Sets alphabetical guides, for 5 x 8 cards, 125 to set, celluloided, *buff*	$28.00
5	Sets alphabetical guides, for 5 x 8 cards, 25 to set, celluloided, *buff*	$5.00
5	Sets same, *salmon*	$5.00
5	Sets same, *blue*	$5.00

Pay Numbers.

Quantity.		
5000	Cards, 3 x 5, Special Ruling U. S. Navy Form No. 13, commercial No. 1 grade, light weight, *buff*	$15.00
1	Set alphabetical guides, for 3 x 5 cards, 250 to set, celluloided, *salmon*	$4.50
1	Set numerical guides, for 3 x 5 cards, 1-5 cut, celluloided, 1 to 2000 by tens, 200 cards, *buff*	$4.00

Expiration of Enlistment.

Quantity.		
2000	Cards, 3 x 5, Special U. S. Navy Form No. 14, commercial No. 1 grade, light weight, *buff*. Per M	$5.00
5	Sets monthly guides, for 3 x 5 cards, celluloided, *salmon*. Each	$1.00
1	Set yearly guides, for 3 x 5 cards, celluloided, 1910 to 1917, *blue*	$ .25

Expiration Acting Appointment.

Quantity.		
1000	Cards, 3 x 5, commercial No. 1 grade, blank, correspondence ruling, *white*	$3.00
2	Sets monthly guides, for 3 x 5 cards, celluloided, *salmon*	$ .50
1	Set yearly guides, for 3 x 5 cards, celluloided, 1910 to 1917, *blue*	$ .25

Home Towns.

Quantity.		
1000	Cards, 3 x 5, commercial No. 1 grade, blank, correspondence ruling, *white*	$3.00
100	Guides, blank 1-5 cut, for 3 x 5 cards, *salmon*	$2.00

Continuous Service Certificates.

1 Set alphabetical guides, for 5 x 8 cards, 55 to set, celluloided, *salmon* $1.50

Miscellaneous Stationery.

For use under special conditions which cannot be comprehended in a general schedule.

3000 Cards, 5 x 8, blank, commercial No. 1 grade, correspondence ruled, in 6 assorted colors, 500 of each..... $20.00
3000 Same, size 3 x 5 ..... $6.00

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ON THE RELATIONS BETWEEN THE U. S. NAVAL WAR COLLEGE AND THE LINE OFFICERS OF THE U. S. NAVY.

By Rear-Admiral S. B. Luce, U. S. Navy (Retired).

Note.—The annual Naval and Military Conference was opened at the Naval War College, Newport, R. I., on June 2d, by the Secretary of the Navy, the Hon. G. v. L. Meyer.

Mr. Meyer's address was a clear statement of his policy for promoting naval efficiency and, at the same time, insuring economy.

The most gratifying parts of his remarks were those devoted to the War College and his interest in its future success. He gave assurance that it was his intention to see that, in future, officers would be detailed for War College duty for longer periods than four months. As this was the sole plea of Rear-Admiral Luce, who followed Secretary Meyer, his paper seemed uncalled for. But as it was then too late to recast his argument, the paper was read as originally written.—The Editor.

Mr. Secretary, Admiral Rodgers, and members of the Naval and Military Conference of 1911.

Gentlemen: In extending a few words of welcome I avail myself of the opportunity to explain to those who are here for the first time the relations between the college and the great body of the navy; but more particularly the relations between this college and the line officers of the navy. In doing so I disclaim most emphatically any intention of reflecting in any way upon anyone in office. My remarks are entirely impersonal.

This college was established by the Navy Department to supply certain urgent demands. It has had, and has now, many warm, and I may say enthusiastic friends; but the great majority of line officers have, so far, failed to appreciate its value as an educational institution.

The Civil War brought out the fact that our system of naval administration was organized on the theory of perpetual peace.

It was to remedy this defect, as far as practicable, that the Naval War College was erected. It was designed to produce, by a process of self-education, a body of officers from which to select commissioners (to use a very old term), "commissioners for executing the office of the constitutional commander-in-chief of the Navy."

But the impossibility of the United States ever being at war discouraged the idea of having such a body of officers. Then came the Spanish War. We soon learned to our cost that we had failed to profit by one of the most important lessons of the Civil War; viz., the necessity for the re-adjustment of our system of naval administration. After the very impressive lesson, in this respect, of the Spanish War, a feeble attempt was made to remedy this defect. The remedy was to create a body of officers who had prepared themselves by study at this College for that express purpose. But the effort lacked support, and to-day, after 26 years, there is not a single officer with War College record connected with the administration of naval affairs.

Not that there is any special virtue in a mortar-and-stone building—in the War College itself. The virtue lies in the group of earnest officers who avail themselves of the opportunity it (the college) affords for the study of their profession. It is in the environment, the atmosphere, the community of interests, the association of officers of congenial tastes and pursuits, all tending to one and the same end, that the advantage lies. When an association of officer-students devote their energies to the same lines of investigation, the same course of reading, study and reflection, they derive great benefit from the constant interchange of views. This stimulates originality of thought. The opinions on professional subjects, of officers who have, in this manner, given conscientious study to the various problems of naval science, are of great value. Such opinions may not always be conclusive, but they are always entitled to respect. Not so with those who, however brilliant, have not enjoyed the advantage of that kind of mental training. Now we have here, in the staff of this college, just such an association of officers; officers who are pursuing the same general course of study and who, intimately associated as they are day by day throughout the year, are constantly interchanging views relative to their respective lines of investigation.

Those officers compose the college staff, as I have said, and

their studies are confined to the art of war; it may be *Strategy, Tactics, Logistics, History or International Law.* Those are the officers who qualify themselves for the higher duties of flag officers. But when one compares the number of such officers (at present only about four or five) with the entire body of line officers, from captains to lieutenants, inclusive, some 760 in number, it will be seen how very few there are who are studying their profession—the art of war.

Again, when some years ago a number of officers sought in the Smithsonian Institution the means of gratifying a laudable desire for scientific research, it was assumed that there was a demand for higher professional education. To supply these two demands —the placing of the naval administration on a war footing, and providing higher professional education—this War College was established. But the line officers of the navy have (with the exceptions noted) failed to appreciate it. I shall endeavor to establish the truth of this proposition. It is important that the naval officers of this conference should understand the position of the college in its relations to their own corps. The time is limited to the expiration of the last conference—that of 1910, for changes have taken place since then.

It may be said, in general terms, that this college was established for the express purpose of enabling officers, by self-effort, to build upon the foundation laid at the Naval Academy; and, by successive steps, reach the highest plane of development as militant seamen and statesmen; and thus to qualify themselves for the most responsible duties that can devolve upon a naval officer, viz., as *aides* to the Secretary of the Navy and as the commander-in-chief of a fleet. Experience has shown that this was no idle dream. The great works on "Sea Power," covering over two hundred years of naval history, and containing lessons in statesmanship, strategy and tactics, together with the "Naval War Code," which found ready acceptance by all the maritime powers, prove, were other proofs wanting, of what this college is capable if properly appreciated and rightly used.

It may be mentioned that the greatly lamented Rear-Admiral Sperry first came to this college as a member of the Summer Conference. His keen intellect was quick to perceive the great advantages it offered to the naval student. He subsequently came here for the avowed purpose of preparing himself for wider fields

of study. He thus fitted himself for the honorable and responsible part he took as a delegate, first of the Geneva Convention, in 1906, and later as a delegate of the second Hague Conference in 1907,* and for the duties of commander-in-chief of a fleet. After hauling down his flag, he was unstinted in his acknowledgments of all he owed the War College for his success. Rear-Admiral Mahan's services at this college won for him world-wide fame. May he live many years to enjoy it. But when, in the course of nature, he leaves this world, upon whom shall his mantle descend? Rear-Admiral Stockton, now President of the George Washington University, and Rear-Admiral Chadwick have been mentioned in connection with this college in former papers. The great debt the college owes to Rear-Admiral H. C. Taylor has been gratefully acknowledged already.

But we are told the naval officer to-day is a "fighting engineer," and this mockery of truth has been accepted by the profession. On this pernicious theory, naval education now concerns itself with the engine-room and the battery alone. There it stops. Naval education now concerns itself with the training of arms and legs only. It takes no thought of the brains. It furnishes the means of locomotion and of aggression, but ignores the means of intelligent direction of those forces. That is the attitude of the navy to-day in respect to higher education. Let there be no false issues. It is conceded that every naval officer must be something of a marine engineer; and the better the engineer he is the better for the navy. The point is: Why should his education stop there? That it does stop there explains the status of this college. In the twenty-six years of its existence it has never had a class of officer-students. It has had presidents, and faculty, or officers forming a college staff, but no students. As far back as the administration of 1888 the course of the Summer Conference was cut down very materially on the ground of the "great scarcity of officers," and this before we had a battleship in commission. Thus:

Navy Department, Washington, August, 1, 1888.

Capt. A. T. Mahan, U. S. Navy, Naval War College, Newport, R. I.

Sir: In view of the *great scarcity of officers* for active duty, the Department requests that the course of the War College be limited to three

*See U. S. Navy War College, Proceedings Naval Institute, Vol. 36, No. 2, page 586.

months, beginning August 6. The order will be issued with such limitations. In view of the fact that during the last year's course less than an average of two lectures per day were delivered, excluding Saturday and Sunday, the Department feels that the interest attached to the course will not be impaired by condensing the course into a shorter period.

Very respectfully,

(Signed) W. C. Whitney,
Secretary of the Navy.

This was the time when Rear-Admiral Mahan was preparing his lectures on "Sea Power." The Summer Conferences of four months' duration (practically only 78 days) are the nearest approach to a class of officer-students of the art of war the college has ever reached until within the past year.

For several years of the more recent past, efforts have been renewed to get a class of *five* officers sent to the college for a term of a year or sixteen months, but without success.

All the great masters of the art of war who have written upon the subject, dwell upon the importance of a knowledge of strategy, and the amount of study and reflection required to master it. We give 78 days to it and a vacant chair of Naval History.*

Fifteen years ago this was seen to be trifling with a subject admittedly of the highest importance. For that reason the following order was issued:

Special Circular No. 20.

Navy Department, Washington, February 18, 1895.

1. The Session of the Naval War College and Torpedo School for 1895 will commence on the first day of June next, and will terminate on the fifteenth day of October.

2. It is the intention of the Department to detail a class of about twenty-five officers (fifteen of and above the grade of lieutenant and ten below that grade) for attendance during the session. From this class it is proposed to select five officers to remain after the session to continue the general work through the winter and prepare for the next session. These five officers will be chosen for their aptitude in the work, and their attainment in International Law, Strategy and Tactics.

. . . . . .

H. A. Herbert,
Secretary.

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* The course is nominally four months. But throwing out the time given to International Law, lectures on various subjects, holidays, etc., but seventy-eight days are left for the Art of War!

It will be seen from this order that it was the intention of the Department that comparatively young officers who had shown an aptitude for the cultivation of the higher professional branches should remain at the college for *study;* not to hear lectures, which are very well in their way—but to study. And of all the junior officers in the service it was a modest assumption that five such officers might be found. That was before the Spanish War, when the officers could have been found, had there been anyone in the Navy Department of that day to see that the orders of the Secretary of the Navy were carried out. But there was no one.

To these applications the invariable answer has been, as already stated, that there were " no officers to spare." Considering the educational values of the various duties to which officers may be assigned, the navy register reveals one very interesting fact. Officers are detailed for duty at all the shore stations, to ships on harbor service, to " special service," such as the Fish Commission, obsolete gunboats in the Philippines, and so forth, so that when we come to the War College there are " no officers to spare." This is proof *not* of how low an estimate is placed on higher professional education, but that it has no standing at all. After an experience of twenty-three years' failure to get a class of five officer-students assigned to the War College, its friends were forced to the conclusion that the answer that there were " no officers to spare " meant that there were *no officers to spare for the War College.* This belief was confirmed when 20 officers accepted the official notification and were on their own application assigned to the new School of Steam Engineering. Over two hundred officers applied for admission to the new school; but up to the time of the Conference of 1910 not one officer was invited to apply for the War College. The class of officers at the School of Steam Engineering is limited to twenty. The War College asked for five and was refused. Ten officer-students are admitted each year to the School of Marine Engineering; not one to the School of War. The course at the School of Steam Engineering covers two years. There is no course at all at the School of War. We learn further that there has been established a class of officers for special instruction in ordnance. But there is no class under special instruction in naval tactics and naval strategy. Those branches are simply ignored by the profession.

Applications for the School of Engineering were invited. It

is not known that any such invitation was ever extended to officers to apply for the School of War. On the contrary, it is a matter of common report that such applications have been discouraged. And then we have a seaman gunner's class, electrical classes, yeoman's classes, class for machinist's mates, artificers' classes, musician's classes and classes for commissary stewards, cooks and bakers. All very proper. But in our whole scheme of naval education the principal branch—the branch to which the navy owes its existence—the School of War, has been strangely omitted, Why?

We are being constantly reminded that a battleship is a mobile fortress compacted of machinery for motive power and for the working of the guns. Hence the necessity for special schools of marine engineering and naval gunnery. This is as it should be. The military value of good marine engineering cannot be overestimated, and straight shooting means success in battle. The navy is to be congratulated on the establishment of these schools for officers and on the gratifying results already secured. But why stop there?

The new school of marine engineers was established in order to stimulate general interest in steam and electrical engineering matters throughout the navy, and to provide a method for securing competent designing engineers. The War College was established in order to stimulate general interest in the art of war and to provide competent naval strategists, the central power, the brains, as already stated, to insure unity of purpose among all the various members of the military body whose sphere of action is on the high seas. It is not simply a question of intellectual powers but one of centralization.

The former school achieved immediate success; the latter, after a quarter of a century, is still hoping for it. In a literal sense it requires as much brains to master the science on which the marine engineer's art depends as it does in any other branch of the naval service. The same is true of the science of ordnance and the gunner's art. The establishment of the new schools for specialists has unquestionably done much, and will do still more, to promote the efficiency of the naval service, the end to which we all aim. We thus secure the highest type of the "fighting engineer."

This opens another phase of the question: That there were over two hundred applicants for the School of Marine Engineering and not one for the War College indicates in the most forcible manner the set of the current of thought in the U. S. Navy, on the subject of higher education.

It was General Order No. 27, of June 9, 1909, announcing the establishment of the School of Marine Engineering, that disclosed the fact that there was such a large proportion of naval officers who preferred engine-room training and what it leads to, to training on deck and what that leads to. But, however brought out, the figures speak volumes for the character of our profession. We make ample provision for specialization in three of the branches of the naval profession, including the Naval Medical School, but no provision whatever for centralization. There is no provision for an educated directorate, to harmonize and co-ordinate the labors of the several specialists.

The fact that only a very few officers take up the study of the art of war goes to the very root and foundation of the naval profession. It affects the very soul and spirit of the service. It is universally admitted that we are not a military people. But it was never even so much as suspected that the military spirit was wanting in the navy, a strictly military organization and our first line of national defense!

During our early history (in 1826) a board of distinguished military engineers, in reporting on a defensive system for our seaboard, placed the navy first as being "our only species of offensive force." Furnished with suitable naval bases, "it will then be prepared," the report said, "to act the great part which its early achievements have promised, and to which its high destiny will lead." "It is an axiom in military science," the report declared, "and one fully illustrated by military history, that the worst mode of waging war, although strictly defensive, is to allow its field of action to be within its own borders; and that the best is that which assumes an offensive attitude. In our case . . . we can only assume the offensive through our navy." That is to say that the navy is to defend our coasts by assuming the offensive. To do that effectually demands the forsight of the statesman and the strategist combined. It demands timely preparation and prompt action. It demands accurate knowledge of where the "fighting engineer" is to go, and what he is to do.

But with us the "fighting engineer" must be left in this case to his own devices; for our comprehensive scheme of education has failed utterly to provide for that responsible office—a highly trained directorate. It was fully forty-one days after the battle of Manila Bay before reinforcements left San Francisco, and Admiral Dewey was obliged to telegraph home an urgent appeal for ammunition. The powerful *Monterey* (monitor) and the ammunition should have been sent him at the first indication of war. But in our system there was no one to give the word. We did not understand our own profession! How much have our line officers advanced since then in the study of the art of war?

Two wars (the Civil War and the Spanish War), have brought out the fact that we, as a body, did not know our business; and yet we complacently accept the situation and make no effort to redeem the errors of the past. There were brilliant exceptions to this sweeping assertion, in both wars, as every one knows. We are dealing here with the larger operations of war, and of the conduct of war in general. We are dealing specifically with naval administration. *"Navy, know thyself,"* is a sound Delphian injunction.

History, both military and naval, is replete with instances of aiming at a wrong objective; and positions have been attacked at great loss of life, and battles have been fought without any appreciable influence on the issues of a campaign, whereas the crucial points have been overlooked. We need not go beyond our own Civil War for examples of disastrous campaigns, both on land and at sea, conducted by leaders of undaunted courage and fired by martial ardor, but wholly ignorant of war. Indeed it was that experience that led to the establishment of this college, and yet the great body of our line officers have failed to appreciate it.

In the absence of those very rare instances of seamen and soldiers gifted by nature with a genius for war, the knowledge of military principles has been furnished by military schools, staff colleges, war schools and the like. The experience of the past quarter of a century has shown that the navy of the United States has deliberately chosen to dispense with that species of knowledge.

There is or should be an office above and beyond that of the commander-in-chief of a fleet. The conduct of war, under any

conditions, calls for the very highest proficiency as a strategist and as a politician, using that much abused term in its broadest sense. The chief of that office must be conversant with the basic principles of military science. He must be familiar with the laws of war, and of our international relations. He must be, in short, an officer of the highest professional attainments. To cover this broad field of knowledge requires years of study and reflection. His work, moreover, must anticipate hostilities. Timely preparation is essential to success in war. The first few moves in the great game may checkmate your adversary. Does it not seem pitiable that it is only a very few of our officers who are trying during a so-called "conference" to cram all these professional acquirements into four short months?

It is clear from what has been said that failure to profit by the lessons of two wars, in respect to reforms in naval administration, did not proceed from dullness of comprehension, but because the navy as a body, partakes so largely (as it naturally should) of national characteristics. As Americans are not a military people, it is not surprising to find that their navy is not imbued with the military spirit. It has been demonstrated by the official reports already quoted that the majority of our young officers prefer the mechanical arts to the military arts. But, as in the great body of Americans there are never wanting men of clear military perceptions, so, in the navy, there are officers of decided military instincts. It was hoped that this college would lead to the discovery of such officers, in order to bring them forward and induce them to follow the professional lines for which they had the most aptitude. It was a very wise step to establish a School of Marine Engineering, that, by holding out a reward for proficiency, general interest in engineering matters might be stimulated, with consequent improvement in naval efficiency. But the figures given (twenty officer-students for the School of Steam Engineering, and not one for the School of War) admonish those of you who have the interests of the naval profession at heart to renewed exertions in securing higher education along professional lines. It is difficult to understand why, in the process of differentiation of studies, and of training long foreseen but only recently inaugurated, the study of the art of war, the very purpose for which the navy exists, should be excluded. That grave error must be rectified; and the sooner, the better will it be for the country.

Those officers who come here of their own volition, impelled by devotion to their profession, will find their reward in the preferment inevitable from professional attainments.

It must be clearly understood, however, that they come here as students, not as controversialists. Each officer-student must be (to repeat it for the one thousandth time *) his own teacher. But he will enjoy the great advantage of finding, in the college staff, officers who have already been over much of the ground to be covered and who, if too modest to attempt to lead, can at least point the way. Thus will be illustrated the sound Socratic principle of "drawing out" from each student of war his military instincts.

One word here about these Summer Conferences. They are the nearest approach the college has ever reached, up to the present, of obtaining a class of officer-students. They were not what the college wanted, but the best the college could get. They have been productive of some good by showing officers of receptive minds how much there is to learn in their profession. But, on the other hand, they have been productive of no little harm, by giving officers, perhaps unappreciative, who came here for only four months, a wrong impression of what the college stands for. Called upon in conference to discuss questions in naval science to which, in many instances, they have never given a moments thought, it has been found, not infrequently, that there is a wide divergence of opinions on important subjects. Experience has shown that officers of the conferences of the past have expressed with great confidence very crude views—the views of bright but untrained minds. When these prevail, as they sometimes have done, the resultant goes forth with the *imprimatur* of the college, greatly to its detriment.

The remedy for this unsatisfactory state of affairs is simple. Let officers who have completed their terms of sea-service in their respective grades, come here for a two-year course of *study;* not for discussion, *but for study.* On the completion of such a course they will then be eligible as conferees to discuss intelligently questions relating to naval warfare—and not before.

* In the various papers on the War College this point has been repeatedly insisted upon.

An officer should not leave this college thinking he has mastered his profession when he has learned something of his terminology only. It is one of the sayings of Napoleon that to master the art of strategy necessitates incessant study and exhaustive thought. "Productive thought is the chief means as well as the chief end of education," says a recent writer. "Forming one's own opinion," he adds, "is infinitely better than borrowing one." Be good enough to understand that I am not criticising the college or its methods. I am commiserating it. Without a class of officer-students, and with a term of only four months, these conferences were in a sense forced upon the college. The college has had to take what it could get, and be thankful it was no worse.

The point I wish to make is the lack of perception by the naval profession of the proper relations between the several parts of our system of naval education. Our line officers seem to suffer from a species of "mental astigmatism" (to quote a learned authority on education *), or the inability of the will to focus the mental rays effectively upon the subject of naval education. "The rays of the mind are foreshortened," he says, "or they are unequal, or they are divergent." This is not uncommon with individual students. But it is very rare when the great majority of the members of a profession are so afflicted. Our officers fail to regard the navy as a unit, with several interdependent parts, just as the human body may be considered a unit made up of interdependent parts. The specialist can diagnose his own particular part only, irrespective of all other parts and without regard to the whole. But he only is master of his profession who can diagnose the entire body and discern the relations between the several parts and the influence of each upon the whole. Your profession is the art of war, and nature will be avenged if you violate one of its laws in undertaking to make a part greater than the whole. You give two years to marine engineering and but seventy-eight days to the study of the art you pretend to profess! This is not astigmatism. It is a total eclipse of the mental vision. You cannot even see the grim humor of it!

* See very instructive works on Education entitled "A False Equation," by Melville M. Bigelow, Dean of the Boston University Law School, and "Unity in Modern Education," by Mr. Brooks Adams.

A notable example of this obliquity of perception in regard to educational questions is to be found in the Navy Regulations of 1909. This was fully set forth in the article "On the true Relations between the Department of the Navy and the Naval War College." (See Naval Institute, Vol. 37, No. 1, page 85, par. 22.) The net result of this provision is to impair the usefulness of the college as an educational institution and to still further expose the weakness of our system of naval administration.

We have made great advances in gunnery and marine engineering and we are justly proud of it. That is gladly conceded. But after all that can be said in that respect, your profession is the profession of war; and yet, to repeat it, you do not study war. Fancy a university man aspiring to the honors of the legal profession and ignoring the law school and the science of law! The result would concern himself only and the disrepute he would probably bring, in his own small sphere of influence, upon a noble profession. But such ignorance on the part of naval officers imperils the honor of the flag and the safety of the country. What confidence can be placed in the "first line of national defense" when it is realized that those who compose it have not specialized in the art of war?

The common explanation for this extraordinary state of affairs is the absorption of the professional mind in the development of *matériel* to the exclusion of all else. But that cannot be claimed for the entire body of line officers. There are a few officers who have aptitude for certain lines of investigation—such as ordnance, gunnery, navigation, steam engineering and the rest. It is to those comparatively few we are indebted for the great advance we have made in *matériel*. What have the rest been doing? Marking time?

I have endeavored thus far to show you the relations (as I see them) which have, up to a recent date, existed between the Naval War College and the line officers of the navy; not by way of discouragement, but to stimulate you, as far as any words of mine can, to your utmost capacity to perform with diligence the work which lies before you. Recognition has come at last, and that, too, from a source which renders it all the more grateful. The General Board has delegated to the War College its most important duties: those of planning naval campaigns and of

furnishing "tactical plans." This calls for a knowledge of naval strategy, and for the solution of problems in battle-tactics—subjects which, heretofore, the navy has steadfastly ignored. How, or why, this change has been brought about it is unnecessary to state. Suffice to say that it has come and the claims of the War College as an educational institution have been recognized at last.

The object of this college is to enable officers to fit themselves to prepare these war plans. Till the time comes when a sufficient unmber of officers shall have qualified for this branch of their profession, this is obviously the only place where the work can be done. Thus the commanders-in-chief afloat and the officer who, under the Secretary of the Navy, is responsible for the conduct of war, will come to speak a common language.

This gives the college fresh impetus. And it is for you, here and now, to avail yourselves of the turn of the tide. Let it be taken at the flood. Show that the confidence in your professional ability has not been misplaced. Do this and ultimate success is assured.

It is pertinent to remark, however, that had this recognition come at the close of the Spanish War the Navy Department would have had, ere this, a War College of its own. That is to say, it would have had within its own organization, and as part of its machinery, a body of officers who have gone through a full course of study at the War College, and were competent to formulate plans of naval campaigns, and prepare tactical plans covering all possible cases likely to be needed by the Department —competent to perform, in short, all the duties of what is known in military language as a general staff, or, as already expressed, "commissioners for executing the office of commander-in-chief of the navy."

But it is idle to dwell on what might have been. Let us look hopefully to the future. A brighter day has already dawned for the college. It has not only received long-delayed recognition, but that recognition has come in the most practical manner by assigning to the college the most important and congenial work along the highest professional lines.

Nor is this all. The college welcomes to-day for the first time in its history officers who are here of their own choice for a term beyond the customary summer's conference—two officers who

well represent the military branch of their profession. They were anticipated, however, by two officers of the marine corps who greatly to their credit came here a year ago on their own application. This alone argues well for the future.

But better, far better, than all else is the presence here of the Hon. Secretary of the Navy. He has lifted the ban which has, during all these years, suppressed every attempt to develop this college to the utmost possibilities of good for the navy of the United States.

Could his words of promise have been anticipated, this paper would not have been prepared—in its present form at least.

It is hardly necessary to say that in my endeavor to show the relations between the War College and the line officers of the navy no reflection whatever is intended upon any one in office. It is the line officers of the navy as a body who are alluded to (with the exceptions noted), in their attitude towards higher professional education.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A REVIEW OF JAPANESE NAVAL FINANCIAL POLICY.

Translated from *Marine Rundschau's* article, "Flottenpolitik und Staatshaushalt, in Japan," April, 1911,

By Commodore W. H. Beehler.[1]

The Period Before 1868.

Commodore Perry's landing on July 14, 1853, convinced the Japanese that foreign demands could only be resisted by a navy. In 1854 the Shogun government decided to procure war-ships through the Dutch in Nagasaki, and the Daimios of the southern provinces were authorized to possess war-ships. In 1863 the government sent two officers to study in Holland, where the steam corvette *Kagomaru* was purchased.

The greater part of the little navy was lost in 1868 by the insurrection of Admiral Enomoto, an adherent of the last of the Shoguns.

The First Naval Development Period, 1868 to 1894-95.

The present imperial Japanese Navy was developed from the vessels remaining after the war of restoration of the Mikado with the war-ships of the Daimios of the southern provinces, Satsuma, Choshiu and Hizen. The building of the navy was delayed at first by the more urgent needs of the army to suppress internal disorders.

[1] The article published in the German semi-official naval organ is a thorough review of the measures taken by the Japanese to rapidly develop her navy, with great lack of financial resources, that seemed to make the task impossible. The financial problem was almost as difficult as the brilliant contests in battle.

The translator has abridged the original article by omitting some details of minor importance.

The navy was reorganized in 1872 on a plan substantially as at present. The expedition against the pirates in Formosa in 1874, Chinese interference there and in Korean relations, together with disorders in the island provinces, required rapid development of the navy. England served as a pattern and three armored corvettes were built there and delivered in 1877.

Progress was slow until the war with China, 1894-95. Japan could not afford armored ships but procured cruisers and torpedo boats. The larger vessels were procured from Europe; smaller vessels were built in Japanese shipyards. The first government shipyard was laid out at Yokosuka in 1871.

At the beginning of the war with China, 1894, Japan had a fleet of 32 war-ships and 23 torpedo-boats, with a total displacement of 65,582 tons and complement of 13,928 men. The annual cost of maintenance was 5,500,000 yen.[2] The nucleus of the navy comprised:

1 Armored coast defence ship, *Fuso,* of 3800 tons.
2 Old armored gunboats, *Kongo* and *Hi-Yei,* each 2300 tons.
1 Newer armored gunboat, *Chiyoda,* of 2400 tons.
4 Protected cruisers, *Itsukushima, Matsushima, Hashidate* and *Josino,* each of 4200 tons.
4 Small cruisers, *Naniwa, Takashio, Akitsushima* and *Suma,* of from 2700 to 3700 tons. *Suma* still building.

The Second Development Period, 1895 to 1902.

In the war with China the Japanese captured 14 vessels of total displacement of about 15,600 tons, including one armored ship of 7300 tons, one armored gunboat of 2100 tons, and one protected cruiser of 2400 tons. China lost all interest in the navy, paid a large war indemnity, and China's naval progress was set back

[2] The value of the yen fluctuated during this period.

From 1880 to 1884 the yen = $0.90.
In 1886 one yen..... = 0.785.
In 1889 one yen..... = 0.74.
In 1891 one yen..... = 0.78.
In 1893-94 one yen..... = 0.62.
In 1895-96 one yen..... = 0.5133.

Since the adoption of the gold standard in 1897 the value of the yen has remained approximately at $0.505, gold.

15 years. During this war Japan ordered two battleships, *Fuji* and *Yashima,* to be built in England, and after peace began building two small cruisers in Japan; the *Akashi* and *Miyako.* The *Suma* was launched in 1895. The cruiser *Izumi,* ex-*Esmaralda,* was purchased from Chile and arrived in Japan in 1895.

In the spring of 1896, the naval forces in Asiatic waters of Western Powers aggregated 188,000 tons, and Japan felt compelled to increase her navy.

When the prompt payment of the Chinese war indemnity was assured, this fund, amounting to 362,900,000 yen, enabled the government to submit a second ship-building program, which was designated:

THE POST-BELLUM PROGRAM OF 1897.

This program provided as follows:

1. The increase of the navy to 233,000 tons by expenditure of 213,000,000 yen in annual installments for 10 years, or until 1906. The program was practically completed in 1903, as the final installments for 1904, 1905 and 1906 were small. The last ship authorized by this program was laid down in 1902.

2. The program authorized building the following ships:

4 Battleships, each of 15,200 tons.
6 Armored cruisers, each of 9200 tons.
3 Small cruisers, each of 4800 tons.
2 Small cruisers, each of 3400 tons.
3 Torpedo gunboats, each of 1200 tons.
1 Torpedo depot ship, of 800 tons.
11 Destroyers.
89 Torpedo boats.

The ships were built as proposed, except that instead of the three torpedo gunboats they built one despatch boat and one small cruiser, while the number of destroyers was increased to 23 and that of torpedo-boats decreased to 64, besides which they procured two river gunboats. The status of domestic shipyards made it necessary to have most of these ships built abroad by contract, but even at this time they were anxious to build in Japanese yards.

Discussion of the post-bellum Program of 1897.

A. Its Military Political Aspect.

The combined strength of foreign squadrons in East-Asiatic waters was doubtless the direct incentive of this program, though a coalition of all these navies could not have been expected. The program was systematic in providing for six battleships and armored cruisers, as that number was considered advantageous tactically, though they were more influenced by the probable time of completion.

The political weather-vane pointed steadily to Russia. The construction of the great Siberian railroad was being pushed with extraordinary vigor, which roused Japanese suspicions. This road was projected in 1888. In 1889, the stretch to Irkutsk was in operation. In 1900 the trans-Balkan and East-China stretches were operated, and in November, 1901, they completed the South Manchurian branch. In 1894 Russia began to increase her naval forces in the Pacific. In 1895 and 1896 she reinforced her troops in Vladivostok and continued to send additional troops. The Cassini treaty with China was negotiated, by which Russia obtained, viz.:

1. Permit to extend the Siberian railroad through Manchuria to Vladivostok.

2. To build a branch road via Mukden to Newchwang, and extension to the Liao-tung peninsula.

3. To station troops to guard the roads there.

4. To have control of Kiao-Chou Bay for 15 years.

Russia hesitated to take possession of Kiao-Chou Bay for fear of the jealousy of other European powers. In 1898 Russia took possession of Port Arthur.

The Japanese realized the urgent necessity of completing their program for new armaments before the Siberian railroad should be opened for traffic.

The reorganization of the Japanese army was planned to be completed by 1904, and for this in 1897 they had appropriated 81,200,000 yen, which was expended in the period to 1904. The naval ship-building program was completed in 1904, and in the meantime Japanese diplomacy postponed the inevitable collision with Russia until these preparations for war had been completed.

In 1897 the Russian Baltic fleet, which was the practical base for East Asia, consisted of the following modern ships:

5 Battleships, *Poltava, Petropaulowski, Sevastopol, Peresvjet* and *Osliaba.*

3 Armored cruisers, *Rossija, Rurik* and *Gromoboi.*

3 Large protected cruisers, *Warjag, Diana* and *Pallada.*

Japan had six battleships and six armored cruisers, built or building.

B. The Financial Political Aspect.

The estimated increase in the expenses for Japan after the Chinese war amounted 515,000,000 yen. 325,000,000 yen were allotted for the army and navy and 190,000,000 yen for public works, railroads, subventions, etc. The natural resources of Japan could not provide such sums even with the large Chinese war indemnity, since over 100,000,000 yen of this indemnity had to meet unpaid war expenses. Japan was therefore compelled to borrow vast sums of money. This paper cannot go into all details of financial operations, but only a general review.

1. In 1894 Japan negotiated loans of 125,000,000 yen. The cost of the war with China was about 230,000,000 yen exclusive of the cost of suppressing the Formosan insurrection. After paying outstanding claims, the balance of the Chinese indemnity was used for the army and navy, but the navy was also strengthened with additional sums.

2. Additional revenue was obtained by increasing the land tax, sake tax, licenses and duties on imports.

3. Loans payable March 31, 1903, were negotiated:

(a) A foreign loan of 87,600,000 yen for public works and railroads; but as coast defences were included in the public works, this was largely used for army and navy.

(b) An inland loan of 101,300,000 yen was likewise for the public works and railroads, besides which there was an additional loan of 16,700,000 yen for Formosa.

C. Some Peculiar Features of Accounting.

The budgets were usually followed by deficiency bills varying from 9,500,000 to 17,400,000 yen.

In the budget of 1897-98 the accounts for expenses of Formosa were cleverly used for expenses in all departments.

Among the receipts there appeared during the period from 1893 to 1902 the total of 19,000,000 yen from a 10 per cent tax on the salaries of officials.

There is considerable confusion, and even with full details it is impossible to ascertain the amounts expended on individual ships for construction, engineering or armaments.

The Third Development Period, 1903 to 1911.

A. The Period from 1903 to 1907.

The Boxer insurrection in China in 1900 diverted attention from the strained relations between Russia and Japan to Japan's advantage, whose armaments were not completed. The Russian ship-building program of 1898, their occupation of Manchuria and the commercial port of Newchwang, for which they used the Siberian railroad, the increasing concentration of naval and military forces in East Asia with other measures of similar import, and the occupation of Port Arthur especially, determined Japan to increase her armaments, no matter what the cost.

The Russian ship-building program of 1898 was a reply to the Japanese program of 1897, and provided for strengthening the Asiatic fleet by 1905 with the addition of eight battleships and six large protected cruisers.

Russia then built the following: eight battleships, the *Pobjada, Retwisan, Czarewitch, Knjas-Ssuworow, Imperator-Alexander III, Borodino, Arjol* and *Slawa;* and four large cruisers: *Askold, Bogatyr, Aurora* and *Oleg*, besides the armored cruiser *Bajan.* Small cruisers not included. Japan could therefore expect her antagonist to appear off her coasts in 1905 with a superior force of 15 battleships, three armored cruisers and nine protected cruisers, to which Japan could only oppose six battleships and six armored cruisers. More were urgently needed, but whence the necessary money? But inasmuch as Russia built all except three of the above ships in her own slow-building shipyards, she could not overtake the Japanese ships being built in Europe. The prompt delivery of the *Fuji* and *Yashima* in 1897 should have been a warning to Russia. In 1903 all the new Japanese ships excepting two small cruisers had assembled in Japanese waters.

The Japanese press and people were greatly exited, and the possibility of providing still more was vehemently discussed in parliament. Programs were submitted and rejected, new elections were ordered and the new parliament passed the so-called Third Naval Law, which appropriated 99,860,000 yen, to be expended in annual installments for a period of 11 years, to build:

3 Battleships, of 16,000 tons each.
3 Armored cruisers, of 11,000 tons.
2 Small cruisers, of 5000 tons.

The ordinary revenue receipts indicated improvement in the finances; but foreign loan markets continued to be closed to the Japanese government, which was obliged to abandon the proposed reduction of the unpopular land tax. Moneys provided for railroads and public works were transferred to the navy, and all available funds from loans for railroads, telegraphs, etc., were likewise taken under various pleas for the army and navy.

The Financial Execution of the Third Naval Law.

Considerable difficulty was experienced in executing the program with the money appropriated. But they were remarkably successful in building up the navy. The two big battleships *Katori* and *Kashima* were ordered to be built in England at the outbreak of the Russian war. The *Satsuma, Ikoma* and *Tsukuba* were launched from Japanese yards at the close of 1906, and in the next year the *Aki, Ibuki* and *Kurama*. The installments were insufficient to provide for the cost of the ships proposed, including two "dreadnoughts" and four large armored cruisers. Other funds had to be used.

During the Russian war the navy was provided with an extraordinary appropriation of 222,500,000 yen, of which there was a balance unexpended, of 31,500,000 yen, which was given to the navy as receipts under this new law.

For war expenses and to cover this increase in the navy, a total of 1,700,000,000 yen was expended. The cost of the war, according to the "Financial and Economic Annual" of 1896, was 1,982,200,000 yen. The national debt increased from 561,600,000 yen in March, 1904, to 2,217,700,000 yen in March, 1907.

B. The Period from 1907 to 1911.

Japan's naval losses were fully compensated by the ships captured from the Russians, viz.: five battleships, three coast-defence ships, one armored cruiser, five destroyers, three protected cruisers and 14 auxiliary ships, though some had been sunk and raised and others had to undergo very extensive repairs. Japan lost two battleships, one coast-defence ship, three protected cruisers, one unprotected cruiser, three gunboats, two destroyers and seven torpedo-boats.

With the arrival of the *Nishin* and *Kasuga* shortly before the war, the Japanese navy was larger than proposed by the law. There were no just grounds to build ships to replace those lost; these were more than replaced by the captured ships. There was need of building substitutes, not because the Japanese ships had become obsolete in that time but chiefly because they had all been launched about the same time.

A new program was discussed, however, and in the summer of 1907, a supplementing program was adopted, appropriating 333,500,000 yen, including the unexpended balance from the existing Third Naval Law amounting to 81,930,000 yen for new shipbuilding during the following seven years.

From a military point of view, this 1907 supplementing program provided a substantial increase of the navy over the Third Naval Law. The naval minister declared that there was no increase, and claimed that Japan had a number of obsolete ships that should be stricken from the list. The supplement of 1907 provided for the cost of building ships commenced during the war, repairing the captured Russian ships, and the cost of material ordered from England to build the 29 destroyers. There were strong motives to prepare for a possible war with some other nation.

The supplementing program appeared during a period of world-wide financial depression. After the war there was a great boom in commercial enterprises in Japan, but the financial panic in 1907-08 was a terrific shock on the Tokyo exchange.

National development was retarded. The burden of the war taxes was doubled and trebled by so-called tax reforms. War taxes that were expected to be removed in 1906 had to be continued. Commercial and social enterprises were postponed. All improvements and buildings of peaceful character had stopped

during the war, and in the budget of 1906 only the most urgent requirements could be provided in order that all money and labor might be available for the navy. The government was anxious to nationalize the railroads; the debt had to be refunded by a thorough financial reform on a stable basis of normal conditions. The wounds of the war were still painfully felt, involving additional expenses for pensions and care of invalids. Many new problems arose, such as the expense of administering Korea and the maintenance of the large army and navy. A large part of the army was still stationed abroad. Four new divisions of the army were to be organized, and the naval program could not be carried out as proposed.

The conflict caused a change in the ministry. In 1905, Marquis Saiyoni had succeeded Katsura, the "Old Statesman," and in 1908 Katsura again resumed control as Premier and Minister of Finance. A change was made, and the budget of 1908-09 provided for a prolongation of the program period until 1915-16, or two years, and the budget of 1909-10 prolonged it another year, until 1916-17, with consequent reductions in the annual installments, to expend the money not before the end of the prolonged period.

JAPAN'S NAVAL SHIP-BUILDING LAW PROGRAM OF 1907.

1. Balance from Law of 1903, period of 11 years, Third Expansion Period 1903 to 1913:	
For new ship-building and public works, Chapter E, subsequently Chapter VI	yen. 81,930,000
Supplementing Program 1907, Period 1907 to 1913:	
(a) For continuing building ships begun during the war; for new ships; and for repairing the captured and own damaged ships.	
Chapter K, subsequently Chapters IX and X	175,000,000
Substitutes for obsolete ships, Chapter M, subsequently Chapter XI	76,577,102
Sum	333,507,102
The installments in budget 1907-08 were:	
Chapter E (VI)	10,401,094
Chapter K (IX and X)	25,000,000
Chapter M (XI)	10,939,586
	46,340,680

The prolongations of the building periods and the reductions in the annual installments involved confusion and changes such that the building program at this date, fall of 1910, stands as follows:

Chapter VI, formerly E, new ship-building and works on shore, Third Naval Law, 1903, Third Expansion Period:	yen.
Appropriation 1903 to 1911	99,900,000
Appropriation 1908-09, prolonged to 1915-16	71,500,000
Appropriation 1908-09, first reduction of annual installment, 3,700,000 to	8,200,000
Appropriation 1909-10, prolonged to 1916-17.	
Appropriation 1909-10, second reduction of installment, 4,700,000 to	6,400,000
Appropriation 1910-11, expended to date	53,000,000
Remaining for 1911-12 to 1916-17	46,400,000
(b) Chapter IX (formerly part of Chapter K). Replacing ships and boats lost in the war:	
Supplementing appropriation 1907 to 1912-13	64,100,000
Appropriation 1908-09, prolonged to 1914-15.	
Appropriation 1910-11, expended to date	48,200,000
Remaining for 1911-12 to 1914-15	15,900,000
(c) Chapter X (formerly part of Chapter K). Repairs of captured and damaged ships; current commissions:	
Supplementing appropriation 1907 until 1913-14	110,900,000
Appropriation 1908-09 prolonged to 1915-16.	
Appropriation 1909-10 prolonged to 1916-17.	
Appropriation 1910-11, expended to date	40,900,000
Remaining for 1911-12 to 1916-17	70,000,000
(d) Chapter XI (formerly M). Substitutes for obsolete ships:	
Supplementing appropriation 1907 to 1913-14	76,600,000
Appropriation 1910-11, expended to date	43,300,000
Remaining from 1911-12 to 1913-14	33,300,000

BRIEF SKETCH OF INTERNAL CONDITIONS.

Katsura's ministry promulgated a plan during the latter part of 1908 for: (1) Rapid redemption of the national debt, (2) the conversion of outstanding loans to reduce the rate of interest, and (3) no new loans. The proposition included reduction of expenses, economy in administration, new sources of revenue, more equitable distribution of the burden of taxation, measures to promote the social status of the people and increase of the salaries of officials.

He began with the redemption of the first series of Treasury notes, amounting to 97,000,000 yen, which was accomplished by the end of 1908. The financial reforms were executed with remarkable celerity, so that by the end of 1910 outstanding loans were reduced 238,000,000 yen. At this time the unredeemed national debt amounted to 2,630,000,000 yen = $1,328,000,000.00.

JAPANESE FOREIGN COMMERCE SINCE 1903.

Year.	Exports.	Imports.	Excess of imports.
	In million yen.		
1903	290	317	27
1904	319	371	52
1905	322	489	167
1906	424	419	— 5
1907	432	436	62
1908	378	436	58
1909	413	394	— 19
1910	473	473	...

The financial condition has improved. In 1911 other measures, such as the income tax, employer's liability, etc., will be adopted.

Some claimed that the government had found means to provide for a new naval building program, for additional administration expenses in Korea, for building railroads in Japan and Korea, for harbor works, for regulating rivers, and for the national steel works, which would all appear in the estimates for 1911-12. This would indicate that Katsura's policy had been successful. The Japanese press was jubilant.

Trade had suffered from the scarcity of money, but revived somewhat when circulation improved through the conversion policy. There was still a lack of confidence in the stability of affairs, but confidence was eventually restored. Trade statistics demonstrated that the government was right in its predicted return of prosperity. The exports in 1910 were 59,800,000 yen more than in 1909, while the imports were 78,300,000 yen greater and balanced at 473,000,000 yen.

Complete details of trade statistics would be voluminous, but they indicate a healthy growth. The large increase of the imports of 1910 over 1909 is chiefly due to extraordinary importation of

raw cotton, amounting to 51,000,000 yen more than in 1909. The most important feature is that the importation of raw materials and unfinished iron and steel products was much greater than previously. The exports in 1910 reached 473,000,000 yen (higher than ever before), and included all classes of exports, among which the exportation of cotton yarn was the largest.

Agricultural interests are still depressed, but the most urgent need for Japan is to strengthen her national credit, which has apparently been partially successful. January 21, 1911, the Minister-President announced that Japanese credit abroad had been firmly re-established.

To return to the consideration of the naval policy, the naval administration was hampered by the prolongation of the shipbuilding program and consequent reduction of the annual installments. The delay was felt still more from the fact that the installments were inadequate to meet the higher cost of "dreadnoughts" to be built to substitute the obsolete ships. The administration was seeking the first financial opportunity to obtain more money. In 1909 the Naval Minister declared that a new naval program would be proposed as soon as financial conditions would warrant. During the latter part of 1909 the press clamored for a Fourth Naval Law, but the failure to negotiate favorable conversion of two foreign loans of 30,000,000 yen each silenced the press until the cherry-blossom season in the spring of 1910, when the fortunate conversion of the great loans of 281,000,000 yen, that reduced interest from 5 per cent to 4 per cent, justified new hopes.

The measure was debated generally during the summer of 1910, and in September the press reported that the new naval law would be submitted. The cost of administration in Korea was only 1,360,000 yen instead of the estimated cost of 12,359,000 yen, and the prospects for the navy were improved.

The desire for more rapid development of the navy was universal. The manager of the Bank of Japan declared that the proper maintenance of a strong navy was not a financial problem for Japan but a necessity for national security. The anti-Japanese agitation in the United States, together with the American policy to neutralize the Manchurian railroads and the discussion of the policy of fortifying the Panama Canal, aided the Japanese naval propaganda considerably. The "Jigo Shimpo" and other naval

organs claimed that without a very large navy Japan would not be able to maintain her national honor after 1917.

Marquis Katsura compromised, and in the naval budget, 1911-12, provided an additional sum of 82,200,000 yen to be expended in a period of six years until 1916-17.

The Advisability of Renovating the Captured Russian Ships.

This work was finished in 1908 by the expenditure of 60,000,000 yen, and has been unjustly criticised. The fighting value of these ships had depreciated by damages sustained in battle and by having been sunk, but they have been thoroughly repaired and have received new armaments, so that they are properly regarded as very serviceable war-ships. In the same time and with that amount of money Japan could have had two and a half "dreadnoughts" built in England, but it was Japanese policy to be independent of foreign shipyards. The domestic yards were at that time fully occupied in building new ships which required such long building periods (4 or 5 years) that they could not build substitutes for the lost ships rapidly. The repairs to the captured Russian ships served to train the dockyard personnel (the work being of a copy character, in which the Japanese excel). The renovation of the Russian ships likewise afforded the navy a convenient lever for new appropriations. These renovated Russian ships served as standards to demonstrate the superiority of new ships built in England. The moral effect in stimulating the *esprit de corps* was much greater by having these captured ships in commission than if they were kept in some naval museum or allowed to decay as wrecks.

THE NAVAL BUDGET FOR 1911–12.

	1910.	1911.	Increase.
	Million yen.		
Ordinary expenses.....	38.5	40.7	2.2
Extraordinary expenses....	37.2	45.5	8.3
Total.....	75.7	86.2	10.5

The growth of the naval budgets is shown in the following table:

JAPANESE NAVAL BUDGETS SINCE 1881-82.

Fiscal years.	Ordinary budget.	Extraordinary budget.	Total.	Fiscal years.	Ordinary budget.	Extraordinary budget.	Total.
	Million yen.				Million yen.		
1881-82	3.0	0.3	?	1896-97	7.4	12.7	20.1
1882-83	3.2	1.6	?	1897-98	9.5	40.9	50.4
1883-84	3.1	5.4	?	1898-99	11.2	47.3	58.3
1884-85	3.2	3.4	?	1899-00	14.6	47.1	61.7
1885-86	2.6	2.9	?	1900-01	16.9	41.4	58.3
1886-87	4.7	4.3	?	1901-02	19.5	24.5	44.0
1887-88	4.9	5.2	?	1902-03	21.1	15.3	36.4
1888-89	5.4	6.0	?	1903-04	21.5	14.6	36.1
1889-90	5.3	5.6	?	1904-05	8.1	12.5	20.6
1890-91	5.8	7.1	?	1905-06	12.3	11.1	23.4
1891-92	5.4	5.6	?	1906-07	28.0	33.9	61.9
1892-93	5.3	5.9	?	1907-08	31.3	41.0	72.3
		Navy only		1908-09	34.3	37.2	71.5
1893-94	5.1	3.0	8.1	1909-10	35.3	36.9	72.2
1894-95	4.6	5.7	10.3	1910-11	38.5	37.2	75.7
1895-96	4.9	8.6	13.5	1911-12	40.7	45.5	86.2

NOTE.—Before the fiscal year 1893-94, the extraordinary budget included the appropriations for both the army and the navy. After 1885-86, the fiscal year commenced on April 1.

JAPANESE FUNDS FOR NEW SHIP-BUILDING, AUTHORIZED 1911.

Chapter VI.	Total for the period 1911 to 1916.	Annual installments. In million yen.					
		1911.	1912.	1913.	1914.	1915.	1916.
Title 1. Ship-building.							
(a) Construction	89.8	11.6	15.3	17.0	26.4	18.5	1.0
(b) Armament	68.5	17.8	15.3	11.8	12.4	10.2	1.0
Total, Title 1	158.3	29.4	30.6	28.8	38.8	28.7	2.0
Title 2.							
Public Works	35.9	5.2	4.9	5.6	3.8	8.2	8.2
Title 3. Repairs and Commissions.							
(a) Construction	19.8	2.9	7.6	5.9	1.5	1.8	0.1
(b) Armaments	34.7	6.3	5.1	6.4	7.6	8.2	1.1
Total, Title 3	54.5	9.2	12.7	12.3	9.1	10.0	1.2

DISCUSSION OF THE SHIP-BUILDING FUND.

The total of 158,300,000 yen for new ship-building appears to be scant. The new big ships cost about 25,000,000 yen each, and for the proposed five such ships there will remain but 33,000,000 yen. Of this, 6,000,000 yen will be required for the three small cruisers, one-half the cost of which is assumed to have been paid. To this the cost of a fourth proposed cruiser of the same size, 5000 tons, at 4,000,000 yen must be added, leaving but 23,000,000 yen. Several installments remain to be paid for the *Kawachi* and *Settsu* which have been building for several years and which cost about 20,000,000 yen each. These two ships were laid down in 1909, in January and April, and 10,000,000 yen are still to be paid for each in two installments of 5,000,000 yen each.

There are thus but 3,000,000 yen remaining for the four destroyers, which are building, with four submarines and one river gunboat. It is not clear how the final installments have been paid for the *Aki, Ibuki* and *Kurama,* nor those for the *Katori* and *Kashima,* which were delivered by Vickers in the summer of 1906.

TABULATED REVIEW OF THE LAST FOUR SHIP-BUILDING PROGRAMS.

Law.	Period and amount. Million yen.	Ships proposed.	Ships built.	Remarks.
2d Naval Law, 1897.	1897 to 1906. Yen, 213.1 millions.	4 Battleships.	4: *Mikasa, Asahi,* * *Hatsuse* and *Shikishima.*	The battleships *Fuji* and **Yashima* and small cruisers *Akashi* and *Miyako* were provided by former law.
		6 Armored cruisers.	6: *Izumo, Iwate, Yakumo, Tokiwa, Asama, Azuma.*	
		5 Small cruisers.	6: *Kasagi, Chitose,* * *Takasago, Tsushima, Nittaka, Otowa.*	
		3 Torpedo gunboats.	2 Riverboats: *Sumidi* and *Fushimi.*	
		1 Torpedo depot ship.	1 Gunboat: *Uji.* 1 (?): *Toyohashi.*	
			1: Aviso the *Chihaya.*	
		11 Destroyers	23: *Akebono, Sazanami, Ikazuchi,* * *Inazuma, Oboro, Shinonome, Murakumo, Yugiri, Kagero, Shiranuhi,* * *Akatsuki, Kasumi, Asashino,* * *Niji, Shirakumo,* * *Harusame, Arare, Asagiri, Usugumo, Ariake,* * *Hayatori, Fubuki* and *Murasame.*	
		89 Torpedo boats.	64: viz., 16 first class, 37 second class, 11 of third and fourth classes.	

* Names of ships marked * are those lost in the war.

TABULATED REVIEW OF THE LAST FOUR SHIP-BUILDING PROGRAMS—Continued.

Law.	Period and amount. Million yen.	Ships proposed.	Ships built.	Remarks.
3d Naval Law, 1903.	1903 to 1913, prolonged to 1916. Yen, 99.86 millions.	3 Battleships.	2: *Katori* and *Kashima*.	1 battleship and 2 armored cruisers to be built.
		3 Armored cruisers.	1: *Ibuki*.	
		2 Small cruisers.	2: *Yahagi* and *Hirado*, building since summer of 1910.	
		6 Submarines.	7: Nos. 1 to 7.	
1907, 1st Supplementing Program.	From 1907 to 1913 and prolonged to 1916. Yen, 333.5 millions.	2 Battleships. 1 Armored cruiser.	2: *Kawachi*, *Settsu*, begun in beginning of 1909.	To be built, 1 armored cruiser and 1 small cruiser.
		2 Small cruisers.	1: *Chikuma*, begun May, 1910.	
		5 Destroyers.	5: *Uranami*, *Isonami*, *Ayanami*, *Kaifu* or *Umikase*, begun March, 1909, and *Yamakase*, begun June, 1910.	
		2 Submarines.	2: Nos. 8 and 9.	
Further Supplement to 1907 Program.		Exact details not known.	(a) The final installments for ships in the old budgets, viz., *Satsuma*, *Aki*, *Kurama* and *Tone*, out of war funds. (b) Substitutes for obsolete ships *Tsukubi*, *Itoma*, *Yodo* and *Mogami*.	The *Nishin* and *Kasuga*, which were bought just before the Russian war, are not accounted for. Probably paid from war funds.
2d Supplement, 1911.	From 1911 to 1916. Yen, 248.7 millions.	1 Battleship.	Not yet begun, though the ways of the *Kawachi* have been vacant since October 15, 1910.	
		4 Armored cruisers.	1: Ordered from Vickers Sons & Maxim, November, 1910.	
		No small cruisers.	Ceased building small cruisers. One still to be built, by program of 1907.	
		? Destroyers.	2 are building, exclusive of the *Kaifu* and *Yamakase*.	
		? Submarines.	Nos. 10 to 13 building.	
		? River gunboats.	1 building.	

During the war Japan decided to build 32 destroyers and ordered the necessary material from England. Three of these were provided for in the budget of 1907, and 29 were built out of the war funds, viz.: *Hatsushimo, Minazuki, Nagazuki, Kikuzuki, Yunagi, Matsukase, Asakase, Asatsuyu, Hatsuyuki, Harukase,*

Hayakase, Hatsuharu, Hibiki, Yayoi, Yagure, Yudachi, Kamikase, Kisaragi, Mikasuki, Nenohi, Nowake, Oite or *Oitase, Shiratsuyu, Shirayuki, Shirataye, Shigure, Ushio, Uzuki, Wataha.*

The Japanese naval administration has been held back in its earnest effort to rapidly build up the navy. In comparing Japanese naval strength with that of other nations the following table of comparative budgets is apparently more unfavorable to Japan than it really is.

NAVAL BUDGETS, 1910–11.

	Total budget.		For ship-building exclusive of repairs.	
	1910–11.	1911–12.	1910–11.	1911–12.
	In millions of yen.		In millions of yen.	
England	381.0	430.0	130.0	147.1
Germany	207.0	215.9	106.7	115.0
United States	266.0	253.0	67.0	69.0
France	180.0	196.7	56.0	68.7
Russia	94.7	118.1	13.5	31.0
Japan	75.7	86.2	27.1	29.3

Japan's probable naval strength in 1917 will be 14 battleships, including four renovated Russian ships; 17 armored cruisers, including one renovated Russian ship. The oldest ships will be *Sagami,* ex-*Peresvjet* ('98) and *Tokiwa* ('98). Ships launched over 20 years are obsolete and not counted.

In 1917 Japan will have nine ships of the *Dreadnought* type, of which five will be battleships and four armored cruisers.

It is therefore evident that considering the inadequacy of Japan's shipyards and steel-works she cannot overtake the preponderance of the United States, nor that of any of the other first-class naval powers, by 1917, without reference to the completion of the Panama Canal in 1914.

A repetition of the plan of purchasing large quantities of armaments abroad, as was done before the Russian war, is forbidden by internal political, as well as diplomatic, relations. Besides, the lack of big ships, to meet any opponent in the immediate future, is not necessarily a political set-back for Japan. Her geographical position, the strategic advantage of which has not

been overestimated, outweighs any opponent's advantage, though her shipyards are inadequate. One glance at the map will demonstrate this clearly. In any war, no matter with whom, except China and Russia, the result will be decided at sea. Supported by Kure and the Inland sea, whose approaches and islands are strongly fortified, Japan will operate on interior lines and wear out any superior naval forces, except England's and soon overcome her enemy.

Without going into details, it is only necessary to note that the three exits of the Inland sea are flanked by the great military ports Yokosuka, Sasebo and Maizuru, and that an attacking fleet would be obliged to watch the second-class military ports of Takeshika, Gensan, Chinkaiwan and Makung, besides all other fortified harbors in Japan, Korea and Formosa, before the Japanese navy could be crippled.

Notwithstanding the Marine Minister is reported to have submitted a plan for new loans, with the idea of obtaining funds for a larger navy, nevertheless the negotiation of a new loan will not be followed by an increase of the navy. While better prospects appear for the country, the affairs are far from satisfactory. A saving has been made in cost of interest, though not as much as expected; credit has been strengthened, and trade has improved, yet the people are still carrying the burden of the bulk of the war taxes, and agricultural interests are greatly hampered. A revision of the income tax is expected in 1912-13, a reduction of the land taxes is contemplated for 1913-14, and in 1914-15 the postponed military budget is expected, so that the navy will be obliged to wait until 1915-16.

Conversion of new loans will be used for carrying out the proposed new tax laws. It is doubtful if the revenue receipts will be increased by the new tariff, and Japan will have to make concessions which will enable reduction of taxes.

Japan must consider other obligations, such as the railroads and regulating the rivers. The budget for 1911-12 contains an item of 180,000,000 yen for river improvements, which amount will be expended in a period of 18 years in annual installments, 12,500,000 yen being that for 1912-13.

The financial status does not indicate any probability of any increase of the navy.

The financial status is completed by the following exhibit:

FINANCIAL STATUS.

	1902-03.	1911-12.	Increase.
	In million yen.		
Ordinary receipts	221.2	492.1	270.9
Extraordinary receipts	76.1	48.8	— 27.3
Sum	297.3	540.9	243.6
Ordinary expenses	171.0	407.1	236.1
Extraordinary expenses	118.2	133.8	15.6
Sum	289.2	540.9	251.7
National debt	552.2	In Dec., 1910. 2630.0	2077.8

JAPANESE DOMESTIC SHIPYARDS AND STEEL-WORKS.

Japan early recognized the necessity of adequate iron and steel works for national defense, but the results of efforts to establish such plants efficiently have not been satisfactory. Japan consumes about 750,000 tons of crude iron annually, of which about 140,000 tons are produced in Japan, and only 180,000 tons of steel. Her iron and steel products are also inferior to those of foreign countries. Japan lacks skilled engineers and labor to compete with foreigners. The works have suffered chiefly for want of sufficient quantities of suitable iron ore. The high cost of iron ore, most of which was imported from China, as well as the high cost of suitable coal, are reasons why the works have not paid.

JAPANESE IMPORTS OF PIG-IRON AND ORES.

From—	1909.	1908.	1907.
	Yen.	*Yen.*	*Yen.*
China	600,000	913,000	753,000
Korea	565,000	416,000	149,000
Others	9,000	2,000	7,000

The national steel-works at Wakamatsu should yield a maximum of 159,000 tons, and when the proposed enlargement is completed, for which 12,400,000 yen were appropriated, to be expended in installments for several years, it is expected to yield about 300,000 tons annually. The works are operated at a loss and are far from paying expenses, which amount to 56,000,000

yen, and thereby have an annual deficiency of 1,500,000 yen. The new Anglo-Japanese steel-works at Muroran will deliver guns and projectiles for the Japanese army and navy, together with railroad material. This establishment has not yet managed to exist. The effort to obtain 10,000,000 yen for building these domestic plants has not succeeded. The future development of these plants is uncertain, and the Japanese naval administration cannot depend upon them.

Recent development of excellent iron and coal areas in Korea indicate a possibility of improvement in the steel production, and the importation of iron from China has largely decreased.

The lack of confidence in the quality of domestic steel products is demonstrated by the rejection of products of the Wakamatsu works on acceptance tests by the military inspectors, which caused great loss to that national plant. The naval minister declared that the naval steel-works at Kure cannot supply the wants of the navy, and that the Wakamatsu works could only supply limited quantities. The delay in completing the guns has repeatedly delayed the completion of ships. Last year the naval administration was obliged to give Armstrong, Vickers & Co. a large order for twelve 12-inch guns.

Duties have been laid on foreign iron and steel products to develop domestic works, and the Subvention Law of 1910 especially provides for importation of ship-building material. The effort to become independent of foreign ship-building has not been fully successful. Japanese ship-building industry cannot compare with foreign plants. The failure of the domestic steel-works and lack of skilled naval constructors and skilled labor contribute thereto. The Naval Minister declared that while it was greatly desired to build all Japanese war-ships in Japan, it must be confessed that such ships are built much better abroad. This statement in the fall of 1910 followed the order given to Vickers & Maxim for one 28,000-ton ship, which will apparently serve as a model for building sister ships.

Parliamentary Co-operation with the Naval Policy.

It has often been asserted that the Japanese Parliament is a complacent body, and instead of the despotism of the Shoguns there is an overstrained militarism and the control is divided by two families, the Satsuma and Chosu. These claims are mis-

leading. The parliament cannot remain silent regarding the political policy nor refrain from giving the masses of the people, who have recently become civilized, a voice in the affairs. Nothing is more natural than that other capable travelled men will participate in the constitutional management of affairs. The present skilful leaders deserve the thanks of the people, and if they should withdraw at this time the country would be thrown into a chaotic condition. The people must first be qualified for a constitutional government. The transition can only be gradual. Any student of Japanese politics will have observed that there are evidences of a break in the healthy development of Japan. To-day new social laws are being discussed. Rome was not built in one day.

There has never been any well-defined opposition party in the Japanese Parliament. Marquis Katsura has had an agreement with his opponents, the liberal majority, who have 204 votes out of 367. The liberals have, however, co-operated with the Administration. This concord was recently disturbed by the rejection of the government's proposed railroad measure, the necessity of which was not clear. The Administration is closely identified with financial banks, and most of the enterprises are decided in secret conferences with bankers and the Cabinet.

Conclusions.

1. In considering a people's willingness to make sacrifices, it is necessary to know their efficiency in both military and industrial affairs.

2. The conduct of the naval policy before the Russian war was admirable; after the war this policy should have been more in keeping with the needs of the country. The unfavorable financial status limited the appropriations for the navy. The last estimates became necessary because of the higher cost of modern ships, especially due to increased displacement and larger-caliber guns.

3. The alliance with England and the treaties with China in 1909 and Russia in 1910, influenced Japan's naval policy, without which Japan would have had less money available for the navy. The treaties with Russia and China did not relieve Japan from the necessity of building strategic railroads in Korea.

4. The influence of the Panama Canal on Japanese naval policy may be ignored, as heretofore, Japan must endeavor to decide any war in Japanese waters.

5. The bulk of the Japanese navy has become obsolete in a few years. A new large increase must soon follow, but this cannot take place before 1914-15 without delaying the tax reforms and army requirements, etc. The increase of the figure of total tonnage displacement of the Japanese navy by 1917 can be accomplished only by purchasing large quantities of material to be ordered from abroad in 1914. This is hampered by the inefficiency of Japan's shipyards and steel-works, upon which gigantic sums have been expended without satisfactory results. The available and proposed war material, in conjunction with the geographical strategic position, insure Japan's national safety.

6. Japanese naval policy has been restricted by the inefficiency of her shipyards and steel-works and improvement in this respect is not evident. The costly effort to develop them is, however, justified.

7. The co-operation of parliament in the naval policy has not been questioned in Japan as in other countries. The budget committee does not submit any naval program which may be disputed. The Administration and the majority in the parliament have worked in harmony, which is a satisfactory substitute for a parliamentary ministry.

8. The peculiar hankering for secrecy which has characterized Japanese naval policy can no longer be maintained so strictly. Fleets cannot be built in secret.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

RECOLLECTIONS OF THE CHINA WAR OF 1860.

By Captain Arthur C. Hansard.

It is perhaps seldom remembered by the present generation that the occasion when Field Marshal Count Waldersee led a combined force to the relief of the embassies and consulates was not the only instance when British sentinels had done duty on the walls of Pekin. It has been written that the city was taken and pillaged. Pillaged it certainly was not, neither is it quite correct to say that it was taken. The sacking and burning of the Summer Palace, situated some five miles from the city itself, may well have led to the misapprehension about the city being pillaged. That deed of retribution was a just and necessary one, a reprisal for a gross act of treachery on the part of the Chinese, by which they captured a number of Europeans and Sikhs composing the invading force.

Some two years previous to this expedition the Pei-ho river had been closed to prevent an embassy from proceeding to Pekin, and in 1860 a British force, under Sir Hope Grant, together with a smaller force of French under General Montauban, afterwards Comte de Palikao, was sent to force the passage of the river past the Taku Forts. This is generally referred to as the Third Chinese War. The war ships and transports assembled at Talien Wan, better known to-day on account of its proximity to Port Arthur. Congregated in this bay were, at the lowest calculation, one hundred vessels, and of all imaginable sizes and rigs, not even omitting the innumerable Chinese junks with their peculiar sails.

I was only a young middy at the time and had just arrived from England. On arrival at Hong Kong everybody was overjoyed to learn that we were in time for the expedition, and we proceeded to the rendezvous without any unnecessary delay.

Whilst here I was transferred to a gun-boat, and I felt that this would give me a better opportunity of seeing shore duty.

All being ready, a fair start was made for the Pei-ho river, where it was intended to effect a landing close to Peh-tang on the south bank, and near the Tanku Fort. The landing force was embarked in launches, and the gun-boats, each having half a dozen of these launches in tow, made in for the shore. In all, there were some twenty or more gun-boats. The weather was by no means very promising, and almost as soon as we started it came on to rain in torrents. However, wet as it was, a landing was eventually effected without opposition on the part of the enemy. Owing to some of our boats getting stuck in the mud, the French were the first to make a landing, and our men, in many cases, were compelled to wade through mud right up to the gates of Peh-tang, where they bivouacked, still in the mud, with only one blanket and a waterproof sheet. It was just a case of water everywhere.

The natives that remained in the vicinity appeared to be friendly enough, offering such assistance as was in their power. The utter indifference they displayed at our presence and the way in which they continued their work was astonishing, but I believe that this was entirely due to the fact that they could see we had a great number of Chinese coolies in our employ.

To the 60th Rifles, who, together with the 15th Punjab Native Infantry and a battery of artillery, formed the 2d Brigade, belongs the honor of firing the first shot in the Third China War, for early in the morning some Tartar cavalry were seen not far from the Rifles' picket, and they were fired on. It was ten days after landing that an advance was made, and Sin-ho was the first place to block our progress. The brunt of the fighting and hard work was borne by Sir Robert Napier's brigade, one battery having a very narrow escape, the enemy's cavalry being within a few yards of it. The work of all hands was rendered very unpleasant by the very muddy and heavy nature of the ground. Within the fort the natives had laid some ingenious traps with a view to our sudden exit. These consisted of large tins filled with powder and placed in a deep hole, and there connected by a rope to a musket. The hole was lightly covered with dirt on a piece of matting; the weight of any man on this would naturally cause it to give way, and his falling on the rope would cause an

explosion of the musket. Luckily these were too obvious to let anybody get caught and no accident occurred. The next obstacle to our advance was the partly fortified town of Tanku. The artillery shelled the place for about an hour, then the 1st Royal Scots, the 60th Rifles and, if I am not mistaken, the 31st Regiment rushed in and succeeded in driving the enemy out. The next afternoon the river overflowed and the Rifles had a lively time of it, their camp being inundated, and great difficulty was experienced in saving their baggage. The following day was employed in making a bridge of boats to enable one brigade to cross the river and attack from the other side. During this work the guns in the Taku Forts were continually fired at the working party, our own artillery replying with interest. It was here that the Armstrong gun was first used in war, and the first shot fired was, to say the least, a very erratic one. During the afternoon and evening our men were hard at work securing the approaches to the forts, and the Chinese, naturally anxious to ascertain what we were doing, threw up, at intervals during the evening, a great number of fire balls of all colors, a sight well worth seeing and long to be remembered.

In the gray dawn the Tanku Forts loomed up in the distance and looked formidable enough, and well might the Chinese think them impregnable and quite sufficient to stop our advance. The attack was commenced early and the fire soon became fast and hot, the Chinese gunners having our range pretty well and being fairly good marksmen. After about two hours' firing, a terrific explosion was heard; this proved to be one of the magazines, and was caused by a well placed shell from our artillery. This explosion was immediately followed by a second one in the fort nearer the sea, on which the gun-boats were firing. These explosions did not, as we naturally expected they would, cause the Chinese to cease their fire, which they did not do till some time later when the forces, both by sea and by land, had drawn considerably closer, their fire decreasing as ours became hotter. Then a breach was made and the flags of England and France were placed on the walls. The 67th Regiment was the first to enter, closely followed by the French 101st of the Line, whose colonel, judging by his name, did not count all his ancestors as Frenchmen, and an after acquaintance with Colonel O'Malley convinced me that he was a thorough Irishman, even to having

been born in Ireland, and to hear him say, "Arra', good marning an' how are ye" sounded just too natural, and made him immensely popular with us all.

It was during this part of the campaign that I first saw a deed of bravery that won the coveted Victoria Cross. It has since been my privilege to see four other deeds of valour that won a similar distinction, one of those being a young midshipman.

The punishment thus far inflicted did not prove sufficient to induce the enemy to surrender the remaining forts, and fresh troops had to be hurried up from Tanku. Their work, however, was not very heavy, as the Chinese, seeing determination on our part, soon surrendered, the soldiers submitting quietly to being made prisoners, first throwing away their arms.

As soon as that fort had been secured, a heavy thunderstorm broke, the whole country looked like a great lake, and the return to camp at Tanku was most difficult; the guns were stuck axle-deep in the mud and the men were knee-deep wading through it, and now I began to bemoan my fate and wish myself snug and sound on board the little gun-boat again. There yet remained what was known as the Southern Taku Fort, but after considerable discussion Mr. (afterwards Lord) Loch managed to get the enemy to surrender, when all the forts were occupied. A large quantity of warlike stores and some very valuable guns were captured. And so ended the first part of the campaign, and the Pei-ho river was open for navigation as far as Tien-tsin. Our losses had been rather heavy, amounting to about fifty killed and some three hundred wounded—the brunt of the fighting, and consequently the losses, being on the British side.

The occupation of Tien-tsin was effected without any resistance, some of the troops arriving by land, the others by water on the gun-boats. Negotiations were carried on for several days, but no settlement was arrived at and a further advance on Pekin was decided upon, the distance being about ninety miles. As soon as this became known, peace was again sued for and it was agreed that preliminaries should take place at Tung-Chow, a town at the navigable head of the Pei-ho river and about ten miles from the walls of the sacred city. With the object of making arrangements for camping grounds and the provisioning of the troops, and while the preliminaries were being discussed, a party of British officers and officials, to the number of about

forty, and including Mr. Loch, Mr. Parkes (afterwards Sir Harry), Mr. Bowlby, the special correspondent to the *Times*, Mr. de Norman and others, together with a like number of French officers, was sent forward to Tung-Chow, escorted by five troopers of the 1st King's Dragoon Guards and a small detachment of the 11th Bengal Lancers under Lieutenant Anderson. The party, in high spirits and with light hearts, entered Tung-Chow, little thinking of the terrible fate that was so shortly to befall them. They had commenced their inspection of the place and were busily engaged making the necessary arrangements when the Chinese army outside the walls suddenly got under arms and, cutting off retreat from the town, enclosed the unsuspicious advance guard like rats in a trap. Colonel Beauchamp Walker and four troopers of the K. D. G., seeing what was going on outside, immediately sent to warn those inside of their danger. At the same moment a French officer and his orderly were attacked and Colonel Walker with his companions galloped to their rescue. The Frenchmen made a gallant stand, but were soon disarmed, cut down and hacked to pieces, but not before the officer had shouted a word of warning with his last breath to the Englishmen. Then Walker and his gallant little band dashed forward, sword in hand, and cut their way through the Chinese army amidst a storm of bullets. They did not, however, reach their lines without paying toll, for Colonel Walker and Mr. Thompson were both hit, the former in the hand. He had his sword wrested from him in the mêlée, and Mr. Thompson received a thrust in the back. The troopers displayed coolness and gallantry, but they, too, had a man hit, and when the party, galloping and breathless, reached their lines, a loose horse, wounded and riderless, fell dead in front of Sir Hope Grant, a sure messenger of "bad news."

The allied commanders were already aware that a large cavalry force was somewhere in front, having observed the remnants of the encampment they had just abandoned, and they had, none too soon, agreed upon a plan if obliged to fight. General Montauban wanted to attack at once, but Sir Hope Grant, with cooler judgment, decided to give the Chinese a chance to keep their promise, rightly saying that the first shot from our guns would be the death warrant of our people in Tung-Chow. He also desired to await the return of Mr. Parkes, the interpreter,

who, the general remarked, from his intimate knowledge of the Chinese and their ways, was worth an army in himself.

During all this time and up to the very last moment the Chinese did not cease their traitorous farce of sending mandarin after mandarin, some of them of high rank with many retainers, to arrange the details of our reception; the last one arrived only an hour before Colonel Walker and his party were seen scurrying across the plain chased and wounded, and he had the effrontery to demand an interview with Lord Elgin to settle the ceremony of the ambassador's entry to Pekin. The General told him that ambassadors did not march with the advance guard of an army, but since it was a question of etiquette he would like to know why the place appointed for our reception was still occupied by the Tartar army. Not a whit discomfited, the mandarin coolly replied that there was evidently some mistake and that he would immediately order the army to retire. There could be no doubt now that some treachery was afoot and an instant attack was decided on; in fact there was nothing else to be done, for the allies did not number over four thousand men at most, and they could not hesitate in front of an army of thirty thousand Tartars. As the French force had no cavalry, except the personal escort of the general, consisting of a few Saphis, General Grant had, as an act of friendly courtesy, lent him a squadron of Sikhs (11th Lancers), who were soon made use of. The two commanders shook hands in front of the troops and the French general galloped off to open the engagement on the right by turning the left flank of the enemy and so driving them under the fire of the British guns. After some cannonading, Montauban ordered his cavalry to charge and away went the little band of Sikhs and Saphis with turbans and burnous fluttering in the wind, and they ploughed a furrow as they went, and as far as the eye could follow, in the midst of the Tartar host. They reached a battery of five brass guns which they promptly took, sabering the gunners as they attempted to run from their posts, themselves losing an officer killed and another wounded. Montauban continued his advance and presently came upon a force of sixty bronze guns on a canal bank; a flank artillery fire was brought to bear, the guns were quickly dismounted and the Tartars were thrown into confusion, and they retreated, leaving all their guns in our possession.

Sankolinsin was the Chinese commander, and a man of great repute amongst them: he was a burly-looking Tartar, somewhat short of stature, and had a red, pimply face, as if he indulged too freely in samshu, the native spirit. Our soldiers called him Sam Collinson, and declared he was a runaway from the Marines. His Tiger Guard was dressed in yellow and black striped uniform to imitate that beast.

But what of the captives in Tung-Chow? As soon as the battle was over, a demand was sent to the taotai or governor of the town for the release of the prisoners. He replied that they had already been taken away and that he knew nothing more about them. We do know now, but we did not at that time, that they had been bound hand and foot with green withes, then thrown into a common country cart and sent off, some first going to the Summer Palace to gratify the eyes of the Emperor and his ladies, and then to forts further up country, where they were murdered or left to die, whilst the others were sent direct to Pekin, where they were put in cages, horribly tortured and many of them done to death after days of terrible cruelty. Captain Brabazon of the Royal Artillery and the Abbot Duluc were put to death on the field after the battle of Palikao Bridge, several days later. Of these two nothing was ever found except a small piece of artillery overall and a small bit of the missionary's cassock. A year later the father of the gallant officer came to China to search for the remains or to find some relic of his lost son; but a careful and anxious personal enquiry led to no discovery, and to this day his last resting place is unknown.

It may here be stated that an edict signed by the Chinese Emperor was found in the pocket of a mandarin of high rank that was killed at Taku, directing that all his subjects should kill and destroy the barbarians, as they were malicious beasts. The manifesto further put a price on the heads of the ambassador and the generals.

As the prisoners were no longer in Tung-Chow and the enemy had withdrawn from that town, it was decided to march direct on Pekin. The Chinese had determined to play their last card and make a stand at the Palikao Bridge, a handsome white stone structure over the canal which joins Tung-Chow with Pekin and completes the waterway between the city and the sea. Here they had assembled a great force of cavalry, supported by guns and

infantry; they numbered from fifty to sixty thousand men, and the allies perhaps five thousand. On the morning of the 21st of September, three days after the battle of Chang-Kiawan, the allied forces marched to the attack and the battle commenced: the Tartar cavalry moved slowly and with great precision, taking their orders by flag signal from a gigantic Tartar who stood near the head of the bridge with an enormous flag of black and gold, and who acted as a kind of fugleman to transmit the orders of their commander-in-chief. More than once did the mounted hordes gallop up to within fifty or sixty yards of the French front, quickly correcting any gaps or confusion in their ranks by the withering fire of the infantry, returning again and again to the attack. To envelop the small force was evidently the plan, and continued well-executed attempts were made to get round our flanks, also to get in between the French and ourselves. But Armstrong shells and French shrapnel did their work, and presently the heavy masses began to break and a well-executed movement to the rear began. Before this had set in, however, the British cavalry force, consisting of two squadrons of the K. D. G., the 11th and 19th (Fane's) Sikhs, had a rare opportunity which they did not neglect to take advantage of, and thirsting for revenge for the base trick which had entrapped their comrades, every man's blood was up when the order came to charge. Then did Lancer and Dragoon, with set teeth and willing arm, prepare to take vengeance on the treacherous Tartar. The enemy awaited them on the opposite side of a sunken road with a four-foot drop into it and a six-foot bank on the other side. The Tartars had chosen their positions cunningly, quite expecting to see the "barbarians" tumble into the road, or at any rate to be put to confusion and disorder by it. On came the glittering wave of steel, and, although the sunken road and bank shook the symmetry of the formation, they easily surmounted these obstacles and in another moment were in amongst the Tartars, who, mounted on their sturdy little cobs, were just the right height for the sword arm of a dragoon. The Indian lancers, separated by a village from the British, did capital execution on the left, but a dry ditch put most of their rear rank down, so they only accounted for one hundred of the enemy as against over two hundred cut down by the heavies. The huge signalman remained, as if he had a charmed life, at his post on the bridge till the very last; cool,

erect, and regardless of the slaughter going on around him, he stood his ground with courage, never attempting to budge an inch, even when left alone amongst the dead, until at last he fell, shattered by a French shell, and still grasping the flag-pole; he fell amidst the admiration of his foes.

There was nothing now between the allies and the capital, nothing to save it; and yet, notwithstanding the fact that the "barbarian" was at their gates and their Emperor was on the point of flight, the stupid arrogance and incredible pride of the celestials would not allow them to give up the prisoners. Temporizing and excuses were again resorted to, and they would get up all sorts of trickery to gain time. They assured us that the prisoners were all well and that their presence at Pekin was a guarantee of our pacific intentions, and that they would be given up when the treaty of peace was signed and we had withdrawn our troops. Such were the excuses put forward by Prince Kung, brother of the then Emperor. A fortnight had been wasted in foolish talk, all of which ended in nothing. The prisoners had not been returned and there was no sign of their being released, and the cold weather was fast approaching; so on the 5th of October Lord Elgin found himself forced to direct an advance on Pekin.

On the following day the two armies, marching within easy distance of each other, soon found themselves within sight of the city; but at this moment the French were missed, and now occurred a circumstance that caused some ill-feeling at the time and much discussion afterwards. The French found themselves at the close of the day at the far-famed Summer Palace, situated about five miles from the city and at the foot of the first range of hills, and they very promptly proceeded to pillage it, whilst our cavalry brigade, which had lost touch with our own force, joined the French and occupied itself in outpost duty around the vast structure to guard against surprise. As for the rests of our force, unavailing search was made by them for the French, and when night fell they bivouacked in front of Pekin on the ground agreed upon. At daylight the next morning, October the 7th, Major Garnet Wolseley, D. A. Q. M. G., was sent out to find our allies. Taking a small escort, he made a shrewd guess as to the best direction in which to start his search, and soon came across the trail of our cavalry in the direction of the Summer

Palace. The Frenchmen seemed as free with excuses as the Chinese, for they made enough in trying to account for their mysterious disappearance. Sir Hope Grant joined forces with the French and the removal of what remained was methodically carried out, the soldiers working in parties under their officers. A prize committee was appointed and everything that had been collected was sold at auction, when exceedingly high prices were realized; the total amount so obtained was used as a prize fund. The writer is still in possession of a pair of lady's slippers which cost him just about ten times as much as they were really worth. To describe the splendors of this Palace would require a far abler pen than mine. I have heard the French likened to bees on a summer day, with gold watches hanging to their buttons and their pockets stuffed with priceless pearls and precious stones, magnificent musical boxes playing as they danced with excitement on gorgeous silks and furs which strewed the ground as mere dirty rags in the mud. At length the busy toilers, tiring of their work, turned to amuse themselves by breaking the vast and beautiful mirrors on the walls. Loot! the very delirium of loot! The French officer to whom I am indebted for a description of the pillaging, when speaking of the scene, said it was a veritable nightmare. Whilst to the French undoubtedly belongs the blame, if any, it must not be supposed that the English had not a hand in the sacking. It was an act of retaliation in which we took a lively hand, and, late as we were, we managed to secure not a little valuable booty. For instance, I asked another midshipman of my own ship if he had secured anything of interest; he carelessly pulled a handful of rubies and other stones out of his pocket, saying: "Oh yes, I got a few of these kinds of things"; and I showed him a regular chunk of cornelian which was then doing duty as a letter weight, but was afterwards cut, and a piece of it forms a pendant for my watch chain. Then there was a lucky individual who found a joss about three feet high which had been upset from its pedestal and was lying on the floor unnoticed; but he had not been through the Sepoy mutiny for nothing, for the ugly joss found its way to England, where it realized five thousand pounds. Comte d'Herrison mentions that a Saphi, his orderly, brought him a handful of pearls which he refused, but which the man sold for a bottle of brandy to another officer. True enough, brandy was a luxury and was worth a hundred

francs a bottle—if you could get it—but then, the pearls were worth from forty to fifty thousand francs at the least. Rennie's "British Arms in China" gives a good description of the Summer Palace, with its lakes full of gold fish and its many beautiful water-birds.

On the 8th of October the allies again started for Pekin, and the Chinese were notified that the prisoners would have to be released and in the British lines and the city gate opened, otherwise an entry would be forced. About two o'clock that same afternoon the prisoners were brought in to our lines, or at least as many of them as remained alive. Of the twenty-six English and Sikhs and thirteen French entrapped at Tung-Chow only eleven of the former and six of the French were restored. Lord Loch, in his "Personal Narratives," tells of the indignities to which he was subjected, the cruelties and the horror of hanging to a rafter by the wrists and ankles as if he were a hammock, and the agonies of thinking that each day would be his last. Sir Harry Parkes also gives a good account of his sufferings and troubles and how he was brought out nearly every day to be executed.

The allies were quartered outside the Anting Gate, but the great difficulty was to find anybody holding a responsible position to treat with, as all the principal mandarins had gone away, those who remained being nothing but minor officials and understrappers, who certainly had no power to treat; neither did it appear that any of them had any great desire to do so. The situation was, to say the least, an embarrassing one, for here we were, to all intents in possession of the city, but nobody would take any notice of us. We had no desire to have the capital of the Celestial Empire on our hands, but to get the treaty signed as soon as possible so that we might get away before the Pei-ho river was frozen over and the rigors of winter set in, thus preventing our getting away for at least three months. However, after considerable persuasion and by showing them the risk they ran of having their city given over to pillage and destruction unless they acted at once, they managed to find Prince Kung, who came with fear and trembling to treat for peace. In the meantime the British siege-guns had arrived and everything was in readiness for breaching the walls unless the Anting Gate was given up as security and as a guarantee of good faith whilst the

ambassadors entered the city to sign the treaty. At noon on the 13th the guns were to open fire unless the gate were previously surrendered. As the time approached, no sign was made from within the city. The scene was an interesting one; the field and breaching-guns were in position, and the gunners were standing to their guns, which were ready loaded, and the officer only awaited the word to fire. Sir Robert Napier stood, watch in hand, and every field-glass was directed at the gate and every eye was turned in the same direction. The order to fire was almost on the lips of the general when the gate was seen to be opened and the surrender was announced, and a few moments later the 67th Regiment and the 8th Punjabees entered the city, and guards were posted on the walls, and field-guns were placed near the gate so as to secure all approaches, and the position was placed in a state of defence.

Prince Kung, having been assured of his own safety, had returned to the city—if he had ever been out of it, which is very doubtful—but even at this crisis, when the guns were ready to open fire on the city, it was the same old story of procrastination, and every effort was made to postpone matters. It had to be, however, so on the 24th of October Lord Elgin entered the city in great pomp with an escort of five hundred men and proceeded to the Board of Ceremonies, where Prince Kung, with the usual formalities, attached the Great Seal to the treaty, which was thereupon signed and exchanged. Several days later the French treaty was likewise exchanged, Baron Gros proceeding to the Board of Ceremonies in a Sedan Chair. Embassies were established and Mr. Bruce was appointed first British Minister to the Court of Pekin, and on the 9th of November Lord Elgin and Sir Hope Grant, with the troops, left on their return journey to Tien-tsin, and the China War of 1860 was over. The war was over, but there yet remained to be collected an indemnity of two million pounds sterling, together with one hundred thousand pounds to be paid to the families of the murdered prisoners. Until this amount was fully paid and our minister safely installed in Pekin, a strong brigade, consisting of Fane's Horse (the 19th Sikhs), two batteries of artillery, the 31st Regiment and a detachment of Military Train, under the command of Brigadier General Sir Charles Stavely, occupied the city of Tien-tsin, where they were cut off from all communication with the outer world on account of the river being frozen over, for the next four months.

Several gun-boats were also frozen in at the same place, that to which the writer was temporarily attached being amongst the number. Every preparation was made on board ship to meet the severe cold of the winter and the heavy snowfall was provided for by roofing in with canvas or boards, and as little work could be done, we had to do our best to provide healthy amusement. Drill was regularly performed on the ice and on the snow when it had set hard enough to allow free movement on it. There was, of course, any amount of skating, and sufficient ground was cleared of snow to allow of foot-ball being played. Fishing in Chinese rivers did not much appeal to any of us, and there was no shooting to be had. When the frost broke up and allowed a movement on the river, I was fortunate enough to be ordered up to Japan to join my own ship, where I was stationed till the middle of August, 1865, taking an active part in the expeditions to Kegoshima and to Shemonoseki; but of those little episodes I have told fully elsewhere, and they have nothing whatever to do with the China War of 1860.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SOME NOTES ON THE TRAINING OF MARINES FOR ADVANCE BASE WORK.

By Major Henry C. Davis, U. S. M. C.

It must become apparent to officers of the Marine Corps, as time goes on, that their function as a part of the Naval Service is becoming more and more clearly defined.

That function is to have at the disposal of the Navy Department a trained force ready and organized at all times for Advance or Mobile Base work.

In the training of the young officers who come into the corps, no matter from what source, particular stress is necessarily laid on the fundamentals of military education, and that training is therefore confined to the essential military features of their particular and peculiar duties as officers of the Marine Corps ashore and afloat. It is not my purpose to suggest any changes in that course as it now exists and is taught at the School of Application, but I would like to suggest something for the training of such officers of the Marine Corps as are fortunate enough to be allowed to attend the Advance or Mobile Base School.

In the organization of a force for Mobile Base work, the three most important heads or subjects under which others come in the formation of a course are the Infantry, Artillery and Signals, under this last head being included all the electrical features of the work.

Under Artillery are included mines, countermining and boom construction. Signals would also include, under the general heads Visual and Electric, the sub-heads Wireless, Buzzers and Sounders, Ardois, Wig-wag, Whistle, Semaphore and Telephone Installation.

It will therefore be necessary, in the organization of an Advance Base force, to include officers who have specialized in these main divisions; that is, in Infantry, Artillery and Signals.

Beginning with the Infantry, we must first assume that at the place where the school is located there is stationed not less than a full regiment of marines which will be available for the instruction of the officers and men in infantry-drill regulations.

The main features of the present infantry-drill regulations, in so far as they apply to close-order formations, are, I think, acceptable to most officers and need not therefore be changed except in one or two minor points which are not of any consequence.

In the application of this same book to the battle exercises, or as it is at present called, the "normal attack," we are forced to recognize its absolute failure to meet modern conditions.

The theory that troops must be thrown into the firing line in a steady stream is correct, but that it will ever be possible to do it, under fire, as prescribed in the drill book is questionable to such an extent that the author does not hesitate to say he believes it utterly impossible.

In designing any attack formation no set rules can be laid down, because no mind is capable of foreseeing the sudden changes which take place on the field of battle and which must be met by the resourcefulness of the unit commander nearest the point of change.

All that can be done is for the commander of the regiment to assemble his officers, previous to the action, and give them as clear and concise an idea of his desires as possible. He will assign the objective for his force and when the force is committed to the action its accomplishment of his wishes will be dependent on the subordinate commanders, for modern arms and the cover necessary for protection from them, will prohibit the colonel from doing much more than exercising general supervision on the advance of his entire line.

In prescribing exercises for this training of troops, we have certain tactical situations which are as old as the military art and which will probably never change unless the air men develop machines which will alter tactics and the military art materially, and the battle exercise of the future must be one in which the company commander is made to feel that his most important duty is to get to the firing line with as many men as possible fit to go on with the attack. There can be no doubt but that any body of troops in a modern action will begin to

dig shelter as soon as the enemy's fire is felt. The first shelters will probably be more for concealment than for protection, and as each advancing echelon leaves the shelter it has constructed the following will strengthen it, and the next will in turn strengthen it until we will have in our rear a rallying point well defended by hasty entrenchments.

This must be taught the infantry soldier, and he must be made to feel that a knowledge of how to use and construct cover may sometime save his life on the field of battle.

Another vitally important matter is the rapid and continuous supply of ammunition to the troops in the firing line after the action is well started. The dead and wounded will form a small and immediate stock to replenish from, but some organized system of supply must be worked out and its faults discovered and corrected by constant practice, in time of peace, so that only a little changing will be necessary in time of war, when all the faults of any system originating in peace are sure to be brought to the surface.

The other features of infantry training as they are now taught at all barracks would of course be included in the school, and it is not necessary to go into them here.

A subject which must be considered and very earnestly considered is that of land transportation as it would apply to an Advance Base. It must be first understood that the author makes a very clear distinction between Advance Base forces and Expeditionary forces.

The Advance Base force would probably always operate near to the ship or unit which transported it and would itself be based on that ship, whereas an Expeditionary force might be called on to go to any distance. Only the former is considered here.

Up to the present time, as far as the author is aware, all transportation between marines in camp on shore and the base ships has been done, as far as the shore part is concerned, by that omnipresent badge of a marine force on shore—the ever faithful *push cart* hauled around by marines. It has been successful for that purpose in a very eminent manner, but the author believes better and quicker results with less strain on the men would be obtained by other means of shore transportation. There should be portable railroads for the Advance Base forces and motor trucks for the Expeditionary forces.

If the use of motor trucks is too radical, then at least the quartermasters should have sufficient funds to hire enough draft animals and vehicles to take this work off the shoulders of the fighting men.

I have stated that in my opinion there should never be less than a regiment at the place where the school is located, and I think even better results would be obtained by keeping a brigade of three regiments organized for this particular work at two large posts, one on the east coast and one on the west. The logical places are League Island and Mare Island.

The organization of the regiment for Mobile Base work has been the subject of much thought on the part of the author, and a very brief idea of it is given here.

The regiment should consist of 1 colonel, 1 lieutenant-colonel, 3 majors, 13 captains, 1 captain quartermaster and commissary, 15 first lieutenants and 18 second lieutenants. There should be 12 companies of 105 enlisted strength and 1 company added, to be formed, after the regiment had arrived at station, from the cooks, messmen and other special-duty details, and I would place this company under the charge of the quartermaster of the regiment. Sufficient extra men should be added to the 12 companies, so that the loss of these special-duty details would not reduce the effective strength below 105.

The 3 additional second lieutenants are for the command of the automatic-gun details, and two guns should be assigned to each battalion of the regiment, with the final formation of the detachment much the same as that used at Camp Meyer in Cuba last winter.

Inasmuch as there is no permanent company formation in the Marine Corps, this additional company, formed of the special-duty men, etc., is a simple matter, and, allowing for sick and other casualties, each of the 12 companies of the regiment would always have practically the same strength available for drills and other military duties.

Let us now briefly consider the Artillery of an Advance Base force. It is most likely the artillery of this force would not exceed the 50-caliber, 7-inch gun of the Navy, and it would range from that down to the 3-inch, 50-caliber, for use on the field and semi-permanent platform mount.

It must be understood that what follows is based on the

author's understanding that the artillery of an Advance Base force is to be used for preventing raids and landing parties, and not for attacking ships.

It would be faulty to expose gun positions by replying to the bombardment by more powerful artillery afloat or by any use of them until a landing force had started from the hostile fleet.

Guns of 6-inch caliber have been landed and mounted by marines, and the problem has been one of handling the guns after they are on shore. This has been done in various ways. I am informed that at Olongapo they were skidded up steep hills by the use of blocks and tackle to their positions. The author transported one 6-inch gun over two miles of water, landed it on a beach and then transported it three miles on land from sea level to 188-foot elevation in that distance, by the use of a large pair of lumber wheels and block and tackle; and the force at his disposal for the hardest part of the work was 25 marines, for the country got so rough the owners of the carabaos used in hauling along the so-called road would not allow the animals to be used *because the rocks would cut the hoofs to pieces.*

Different places necessarily call for different methods, but it seems that the method most suitable for all places (from my own experience) would be large wheels with very wide tires and some rapid scheme of lifting the gun off the ground and lowering it to the ground.

The main objection to using the tongue of the wheels for this, used as a lever, is that the strain on the tongue frequently breaks it, and a delay is caused which, with some other method, would be obviated.

At the school there should be a force of men whose special drill would be in the handling of the guns, mounts and platforms contemplated in the Advance Base material.

The officers should have special instruction in ballistics, sights, range finders, manufacture of guns and ammunition, selection of gun positions from maps and charts and the actual work of placing a battery in position.

Officers who had specialized in this subject I would assign to the unit of the force which had had the special work of handling these guns and drilling at them.

In any artillery practice accurate range finding is the first essential, and therefore accurate spotting of shots is necessary.

The ease of finding ranges from shore stations is such that not a great deal of time need be spent on that subject, but the training required to rapidly and intelligently transmit this information with other firing data from the fire control stations to the batteries does require much time and careful training, and a part of the artillery force would require very accurate drill on this subject.

The matter of connecting the batteries and the fire-control stations requires a more or less expert knowledge of electricity as applied to this kind of communication.

This it seems to me should be gone into by officers who have an aptitude for this sort of thing, and they should be trained to apply their knowledge to the solution of such problems of communication as would arise. Searchlights and their use and care would also come under these officers, and it would seem that a body of men should be trained in electricity in the same manner in which men of the electrical corps of the Navy are now trained.

Submarine mines would be a part of the Artillery course, and the planting of mines both for defense and for countermining would be a part of the studies. The actual work of placing the mines must be added to the theory of mine warfare. Certain companies would have this particular work and their officers and men would be thoroughly taught in mines.

There is also contemplated, in the present Advance Base organization, the employment of torpedoes discharged from stationary floats. This complex piece of machinery requires very careful handling on the part of those whose duty it is to use it, and this knowledge can only be obtained by careful study supplemented by the actual work with the delicate adjustments of the engines of a torpedo.

The Secretary of the Navy will very properly demand that when the material of an Advance Base is placed in the hands of the officers who are to use it these officers have the training and the expert knowledge to keep that material efficient and ready for use at all times.

I strongly maintain that no amount of book knowledge will enable any officer to do this unless he has had the practice with these varied and complicated machines. Therefore every feature of the Advance Base organization and outfit should be included in the equipment of the school, and the knowledge of its use be imparted there in theory and in *practice*.

Defensive booms are mentioned "en passant." The English proved that a destroyer would ride over a boom unhurt, but they would certainly very seriously interfere with a steam launch and tows of a landing party and therefore their construction and placing in position is to be taught. It is my desire to convey the idea that all marine officers attending the Advance Base School would get a working knowledge of the various subjects taught there, but to those who had shown any aptitude for special subjects as mentioned here I would try to arrange the course so that those officers could specialize in the desired subject.

If the time arrives, and we presume it will, when various points have garrisons which are really Advance Base forces, I would try to make the details for those posts as much as possible in the branch in which the officer going had specialized. After a tour there and on next assignment, I would try to change the duty or the branch so that officers would get varied duty.

Time and again forces of marines have been ordered out on very sudden notice, and many problems *which should have been solved at home* have been worked out upon arrival at station after a certain time had elapsed. In time of war the fact that these things had not been foreseen might prove a very serious handicap, and the locking of the stable door after the horse has been stolen has never yet proved to be a very good preventive measure.

The location of the school in some yard where plenty of space is available for drill and work is necessary. During the summer months the men can be placed under canvas and the lack of barracks should not prevent the force from being assembled at such yard as is most useful for this work now, and being kept there till the barracks could be built.

The vast bulk of the Advance Base material would require a lot of storage space, and to quickly get it out for use and shipment the force should be familiar with the methods of packing and unpacking, and in the event of its use for business *the way of putting it on a ship is very important.* It has been known to happen that guns have been sent to the front without carriages, and wagon bodies without wheels, and other equally serious mistakes have been made which could have been prevented by a little drill and foresight.

The only method of solving all the problems likely to arise in the consideration of the needs of an Advance Base outfit,

is by concentrating the minds of the officers composing the force on the problem, and it is to be earnestly hoped that the few ideas given here will help bring about a greater interest and a clearer understanding of the gravity of the situation as it now stands.

We have work to do and no tools with which to do it, because the tools have not been fashioned from the rough material at hand.

NOTE.—The terms "Advance Base" and "Mobile Base" are in my opinion synonymous; and while I have used "Advance Base" more frequently, it is from habit rather than intention.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE SPERRY GYROSCOPIC COMPASS FOR NAVAL VESSELS.

By Lieut.-Commander H. C. Dinger, U. S. Navy.

For many years the problem of obtaining a satisfactory compass for naval vessels, especially for use as battle compass, has been one beset with all manner of difficulties. In order to avoid errors caused by masses of iron and steel about the compass, chart houses, bridge rails, fittings and instruments on the bridge or in the vicinity of the compass have been made of brass or other non-magnetic material. If the compass is to be below in some protected position, it is naturally surrounded by various masses of metal. With all precautions that seem to appear feasible, it has been impossible to secure a satisfactory magnetic compass that can be used in the conning tower or central station of a battleship, or below in a submarine. Even those compasses which are above decks, on the bridges and steering stations, are very erratic under battle conditions. Electric alarms, distant control, search-light appliances, telephones, etc., when near the compass, affect it in various ways; while the shock of firing guns and the training of the turrets throw the compasses off to a very material extent.

To conduct accurate battle maneuvers with a fleet, an accurate and reliable compass is essential, in order that courses may be steered exactly and that each change of course may be exact. Likewise, in taking bearings for tracking or plotting the position of the enemy, accuracy of compass is a prime necessity. Applying corrections for compass error is always a disconcerting operation, and opportunities for applying corrections in the wrong direction are always present. Especially is it necessary to have an accurate compass at conning tower or other ship-control station; but with the magnetic compass it seems hardly to be possible.

The development of the gyroscopic compass so that it has reached the stage of commercial practicability gives us promise of a remarkable step in advance in securing an accurate and reliable compass, that will enable courses to be steered with precision and bearings taken accurately while ship is swinging, as well as when she is on her course, and will permit these bearings to be immediately plotted, without loss of time or opportunity for misapplying corrections.

The principle of the gyroscopic compass is in brief general terms as follows: A gyroscope set rotating and freely suspended will eventually take a steady position of equilibrium with its axis parallel to the axis of the earth, and its direction of rotation the same as that of the earth. This can be shown by taking a small toy gyroscope and, while it is spinning, moving it in a circular path. The axis of the gyro will take a position in the meridian with reference to the circular path in which the gyro is moved, and if the motion is reversed the gyro will immediately tumble and thus make its direction of rotation that of the movement to which it is subjected. A gyroscope once in the meridian will resist any force tending to move it out of this position, the resistance increasing with the size of the gyro and the speed of the revolution. Thus any gyroscope of sufficient size and speed of revolution might be used as a compass. The larger the gyroscope and the greater its speed of revolution, the more directive force will such a gyroscope possess.

In order to secure good directive force the gyroscope must have a high speed of revolution and be of fair size; but sufficient directive force can be obtained with practical running speeds, and without making the apparatus cumbersome.

The Sperry gyroscopic compass uses the principle of the gyroscope, but the practicability of its use lies largely in the mechanism for showing the headings without bringing any appreciable force upon the gyro. This apparatus has been the result of years of study and experiment.

The following is a brief description of the apparatus, the description being assisted by several views of the compass and its accessories.

The apparatus consists of a master compass, repeating compasses, the motor generator and switchboard. The master compass, with attachments, is shown in Figs. 1 and 2. The gyroscope

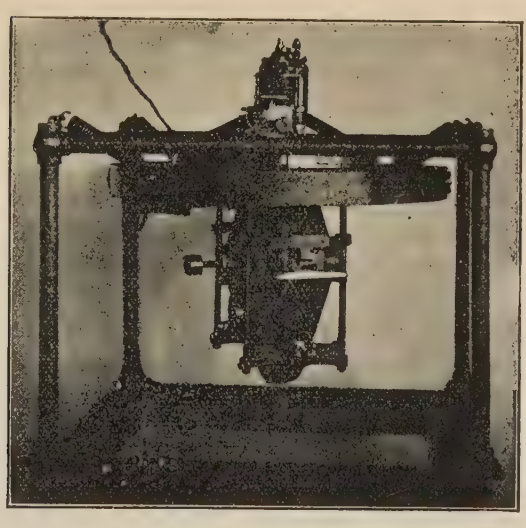

Fig. 1.—Master Compass as Mounted.

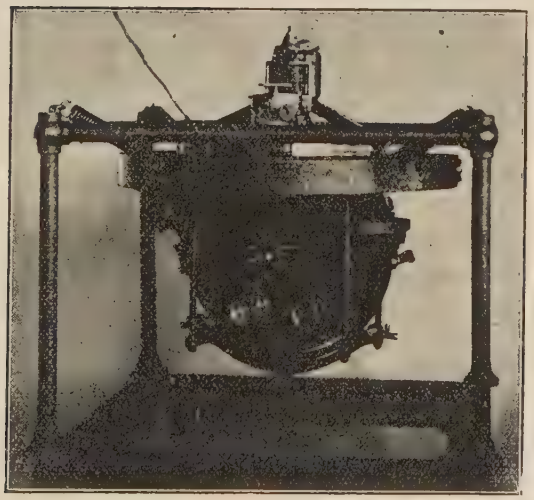

Fig. 2.—Master Compass as Mounted.

is driven by an alternating motor and is included in the gyroscope case. This gyroscope is well protected by its case and is suspended by a piece of pianoforte wire. The gyroscope is operated at a speed of 8000 revolutions per minute. The gyro carries a pointer and contact maker which moves over a contact circle; and as the heading changes, the contact circle moves over this pointer contact maker and this brings into operation the azimuth motor (shown at top of apparatus), which brings the compass circle around to correspond to the position of the gyroscope. It is really only an electric follow-up gear.

The contact circle, compass circle, motor, etc., are carried in gimbel rings, and the apparatus is suspended by springs from some part of the ship's structure. This can be seen from the photograph. The only force exerted by the gyro is to move the contact maker, and this force is practically nil, and there is thus no tendency for the compass to lag and the compass is sensitive to even very small changes in heading. There is a correction made for the speed of the vessel. This correction is very small and only amounts to about two degrees for a difference of thirty knots. The speed correction is made by means of a cam which slightly changes the position of the compass circle. The adjustment is made by moving a pointer over a dial.

The heading by master compass is communicated to the repeating compasses by an electric step-up apparatus; the connection being made at the edge of the compass circle, and it is put into operation as the heading changes. The exact heading of the master compass is by this apparatus given to the compass card of the repeater compass. Repeating compasses are connected by means of a two-wire cable, and as many repeating compasses as may be deemed desirable can be connected, and they can be located anywhere. The repeating compass consists of a small bowl containing the step-up motor, which operates a compass card similar to the card used on magnetic compasses. This card can be seen in Fig. 3. The mechanism of the repeating compass is small and simple, and it is easily portable, the cable being the only attachment required.

For furnishing the current for the motor and alternator, there is a motor generator set, mounted on a common base, and this with a small switchboard completes the apparatus. The electric power required is very small, only a few amperes. An attachment

is also made for operating the gyro in a vacuum. Operating in vacuum materially reduces the power required for operation.

The master compass is located below decks in some well-protected position, and adjacent to it are placed the motor generator set and the compass switchboard. At installation the apparatus is adjusted, and the adjustment once being made, the compass can be stopped and started as desired.

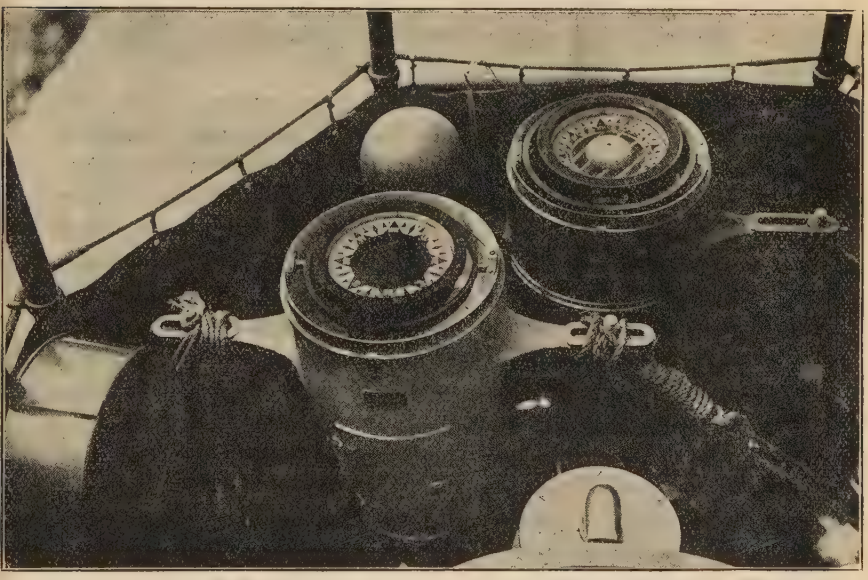

Fig. 3.—Magnetic Compass on Right, Sperry Repeating Compass on Left, as Mounted on Bridge of a Destroyer, Temporary Experimental Installation.

In order to avoid a large number of vibrations past the meridian, and to hasten the settling of the compass in the meridian, a dampening device is fitted. This allows the compass to come to rest in the meridian with but a few vibrations across it. Means for lubricating the various bearings are provided. Spare azimuth motors, and motors and parts of repeating apparatus, can be fitted without disturbance of the gyro.

Starting Compass.—The compass is put in operation by starting the gyro motor. When all connected up and motor generator in operation, this is done by simply throwing a switch. If the

compass is set so as to be approximately in the meridian, it will adjust itself so as to point true north in a few minutes. If started ninety degrees away from north, it will require about two hours to get settled down on true north. After having settled down in the meridian, it will remain there as long as kept going. In port, whenever the compass is not wanted it can be shut down and started again before getting under way. The compass can be started from any heading it may be on, and will itself find the meridian. If it is started near the meridian, it will adjust itself much sooner than if started from a position away from the meridian.

The gyroscopic compass is subject to no magnetic influence whatever. It can be located anywhere, and any mass of magnetic material can be moved about it with impunity. Variation is eliminated, and there is no change due to change in longitude, temperature or heeling. The compass always points true north. The master compass can be mounted at or near the center of motion of the vessel, and, as it is suspended by springs, rolling and pitching have no appreciable effect upon it. There is no heeling error and the compass maintains its heading steady while rolling, and is sensitive only to actual changes in course. The repeating compass is not affected by either its position, motion, or surroundings; it can be placed or moved anywhere as long as it has its cable connected.

Points of Advantage in Use.

The following points of advantage in using this compass readily appear.

(1) *Steadiness.*—As long as the course is not changed, the compass does not move. Rolling, pitching, or vibration do not cause the compass to move, and there is no vibration or swinging of the compass. The helmsman can thus keep *right* on his course to a degree of exactness never to be approached with the magnetic compass. For fast vessels the exact steering of courses is most important and may make a material difference in the actual space traversed by the vessel.

(2) *Reliability.*—As the compass points true north and is not subjected to any magnetic influences either in or outside of the vessel, and simply depends upon keeping the gyroscope in motion, there is practically nothing to throw the compass out.

(3) *Adaptability and Flexibility of Location.*—The master compass is placed below in some well-protected place, but the repeating compasses can be placed anywhere and in any position, and can be moved from one position to another at will. For plotting work the compass can be put right on the plotting board and any bearing plotted directly from it.

(4) *Accuracy.*—All courses can be steered accurately without having to look up the deviation or variation. All changes in course can be made exactly without running the risk of introducing errors in deviation or variation.

(5) *Safety of Compass Installation.*—The master compass being in a thoroughly protected position, there is no danger of having the compasses knocked out by shell fire or other damage to the vessel. Repeating compasses can be connected in anywhere, and can be shifted from one place to another, and all these compasses will read alike and are accurate.

(6) *Recording Feature.*—A continuous recording apparatus can be attached to the compass, and from such a record the course actually steered and any variations in course are recorded. Such a record will be of great value when running in a fog, in night attacks, etc.

One class of naval craft in which it has been especially difficult to obtain a satisfactory magnetic compass is the submarine. On these craft the compass must necessarily be close to many sources of magnetic disturbances, and hence the magnetic compass is unsatisfactory. The gyroscopic compass overcomes all such difficulties that have here been found. The master compass can be located below, and the commanding officer can carry a repeating compass around with him from whatever position he may be handling the vessel.

The Sperry gyroscopic compass has been exhaustively tested and experimented with ashore. It has been tested on the merchant steamer *Princess Anne,* and has also been tested on several naval vessels. These tests have shown it to be an entirely practical apparatus and an accurate compass. The compass is now being manufactured on a commercial basis, and the principal field for its use will no doubt be naval vessels and the large passenger and freight vessels.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

FUTURE DEVELOPMENT OF THE NEW YORK NAVY YARD.

By Naval Constructor W. G. Groesbeck, U. S. Navy,

AND

Civil Engineer F. R. Harris, U. S. Navy.

1. The following plan of development or rehabilitation of the New York Navy Yard, is the result of study and consideration on our part, extending over very nearly one year, and while it is not intended to be comprehensive in detail, it is intended to show the possibilities in the way of developing the present site, with possibly a small addition, to meet the needs of the naval service, particularly with a view to providing adequate berthing facilities for a large fleet of first-class battleships, under such conditions that entry and egress to the station from the East River may be possible under all conditions of tide, and without the many hazards, the loss of time, and the expense involved under existing conditions; and with a view at the same time, to providing a modern, compact manufacturing plant for ship-repair or ship-building, if desired, such plant to have the usual advanced facilities for economical handling and routing of material, with the necessary modern storage capacity for material, trackage and crane facilities.

2. The reason that has prompted us in the preparation and submission of this joint suggestion is that it has come to us from various sources that the consensus of opinion among many officers of the navy, and possibly of the Department itself, is that the present New York Navy Yard, including its location, natural facilities, disposition of shops, plant and water-front, are entirely inadequate and unsuited for its purposes under modern conditions. It has frequently been stated, though perhaps not officially, that

the Navy Department would do well to dispose of the entire site and plant, and look for a more suitable location, probably above the City of New York, upon the Hudson River. The present location of the yard, however, we consider to be ideal from the point of view of supply, both of labor and of materials; and we have been led, in view of the above-mentioned proposition of a change in site, to investigate the possibilities of the present site as regards its development in an adequate and satisfactory manner. When first considering the question in its broadest sense, we inquired into the various properties along the water-front of the greater city, and in fact, the lower Hudson River, and came to the conclusion that there was no site so well adapted to a first-class navy yard and ship-repair and building plant as the present one. This opinion is most emphatically strengthened in view of the investments the Government has already made in the present site in the way of buildings, dry docks and plant, which, with some modifications and additions, may be developed into an ideal navy-yard plant.

3. It may, perhaps, be well to mention here the consideration given to the subject and the work previously done, within the last ten years, with the same end in view—the improvement of the New York Navy Yard. On September 24, 1904, the Navy Department appointed a board of which Rear-Admiral Frederick Rodgers, U. S. N., was senior member, to make thorough examination and complete report concerning the navy yard, New York, with a view to determining what changes should be made so as best to meet the requirements of the naval service. Accordingly, the Rodgers Board report was submitted. The report was very comprehensive and dealt with the subject at issue in great detail, although along broad lines, and was in general approved by the Navy Department. It contemplated the removal of what is known as Cob Dock and the purchase of certain property to the west of the present naval reservation to Hudson Avenue, and at the same time laid down a plan for the improvement of the water-front, consisting of building out piers from the mainland, etc. This report in itself, it is understood, was based on, and in general approved of, a previous report of a board of which Rear-Admiral P. F. Harrington, U. S. N., was senior member (Sen., Doc. 165). On November 19, 1907, the civil engineer of the yard,

Mr. Gregory, submitted a report which in turn was reviewed by Captain J. D. Adams, U. S. N., captain of the yard, and Naval Constructor W. J. Baxter, U. S. N., somewhat modifying the water-front recommended by the Rodgers Board report; but in December, 1909, Rear-Admiral J. B. Murdock, U. S. N., then commandant of the yard, submitted to the Department several plans of water-front improvement, conforming very closely with the recommendations made by the Rodgers Board report. This last-mentioned plan of development was approved and the work now being done is somewhat based upon this approved plan.

4. The plan at present being followed out, which involves the improvement of the water-front solely, is believed to be defective in the following particulars:

(a) The wharves built and to be built from the Ordnance Dock into East River are so located as to be remote from the yard shops and extremely difficult, on account of the tidal conditions of the East River, to get in and out with a vessel, except at slack water; with the tugs available in the yard, it is probably only possible to get one vessel out or in each day.

(b) The wharves in the inner basin, now Wallabout Channel or Whitney Basin, are so short in length that the prows or sterns of modern battleships would project out beyond their extremity.

(c) The spaces or slips between the wharves are so narrow that, with the increased beams of first-class battleships, it would be impossible to place two battleships in a slip, as had evidently been originally planned under the condition of much narrower beam.

(d) Pier "A," proposed by the Rodgers Board on the downstream side of the basin, cannot be built because, with the East River tidal conditions, it would be a menace to vessels entering the inner basin.

(e) The reports and studies made did not consider the necessity for additional docks of greater length and width, and probably did not foresee the necessity for rebuilding dry docks Nos. 2 and 3, in the near future.

(f) The examinations and recommendations made did not consider, or possibly did not foresee, the early development of the navy yard into a ship-building plant having the facilities of building, if desired by the Navy Department, first-class battleships of

great tonnage in practical competition with commercial shipbuilding yards; and it is doubtful as to whether the growth of the fleet, both in number of ships and size, is provided for in both water-front improvement and shop facilities.

5. Up to the present time, it has, from necessity, been the policy of the Navy Department, when vessels of the fleet have been in New York Harbor, to anchor all those not actually undergoing repair at Tompkinsville or in the Hudson River; the berthing space for ships has been so restricted in the yard that the yard has been sorely pressed to provide berths even for those ships actually undergoing repairs or waiting for urgent repair. Even so, vessels have had to be shifted time and time again on account of this restriction. The various accidents that have occurred during the short stay, in connection with ships in this harbor while anchored in the Hudson River, are well known, but have been unavoidable. The plan suggested by us will permit berthing practically the entire Atlantic fleet in the navy yard basin, without interfering with repair or new building work.

6. Six separate steps of development are shown, and are described as follows:

Step No. 1, Plate 1.—From the present yard to the condition shown on Plate 1, in which Building No. 10, joiner shop and C. & R. power plant, Nos. 115 and 117, and 6 and 7, are shown as removed and replaced by fabricating shop for the Hull Division and a covered building ways. Dry Dock No. 4 is shown as completed, as is also Pier "D." It will be noted that one of the present cantilever cranes over the building slip is shown to the north of the fabrication shed covering the storage yard. This seemed to be a good disposition of this one crane, which the new covered building slip will put out of service. Attention is invited in this connection to the fact that the present cranes and runways are already inadequate as regards length, height and reach for the construction of Battleship No. 34.

Step No. 2, Plate 2.—Provision and clothing factory is moved from its present site to Building No. 126, and a new modern storehouse is shown. The storehouse is so arranged that stores can be handled directly from cars, elevated to various floors, and distributed by industrial track to different sections of the building. A new fitting-out pier provided with crane track and a berth

on either side for vessels is provided. The remaining portion of Cob Dock is removed. A railroad transfer float is provided at Pier "D," so as to give convenient access for railroad cars to the manufacturing portion of the yard, doing away with the long haul now necessary over Cob Dock and Cob Dock causeway. The fitting-out pier will be recognized as taking the place of two piers (B and C) in the Rodgers Board report. It is imperatively necessary to keep this pier over 250 feet from Pier "D," so as to allow a 110-foot ship and the 125-ton crane *Hercules* to lie between them.

Step No. 3, Plate 3.—Dry Dock No. 2 is shown rebuilt of the same width as Dry Dock No. 4, and 850 feet in length, long enough to take a battleship cruiser of the most advanced type. Forty-ton crane track connections are shown to the Steam Enneering Shops, adequate lumber storage sheds are provided to the east of Dry Dock No. 3; a lighter slip is to be built directly under the proposed cantilever crane near the Hull Division fabricating shed, so that material may be handled from the lighter directly into the plate and shape storage racks. Piers and slips are built out from the present causeway.

Step No. 4, Plate 4.—Dry Dock No. 3 is rebuilt of the same width as Dry Dock No. 4, and 1100 feet long, arranged with an intermediate gate so that the dock may be used to dock two moderate-sized vessels, the inner compartment to be used for long-time repair, or the full length of dock may be availed of to dock commercial vessels of a transatlantic-liner type of the most advanced length. This provision is made in case such vessels should ever be needed in transport service for the transportation of troops or as scout cruisers.

Step No. 5, Plate 5.—The major part of Ordnance or Cob Dock is removed and is replaced by wharves placed at such an angle that ships after coming inside the basin, being protected from current action, may come into or go out of the berths between the wharves under their own steam or with slight assistance from tugs. Oil storage tanks are provided for oil fuel and a new coaling plant is shown. Building No. 75, the present antiquated and obsolete pattern shop, is replaced by an up-to-date and modern pattern shop.

Step No. 6, Plate 6.—Shows the property to Hudson Avenue acquired by the Government, as recommended by the Rodgers

Board, and wharves and slips constructed in this vicinity, and also provides a space to the west of building ways No. 2, for an additional building ways, or as a fitting-out basin.

Plate 7.—Shows a general lay-out with some details of the proposed storehouse. The size and height of this building need not necessarily be followed, although the arrangement for economical handling of stores we believe worthy of consideration as a feature of economy and one that, if capitalized, would well warrant the outlay.

Plate 8.—Shows general details of the Hull Division fabricating shop with the ship-building ways. The shops are so laid out that raw material may be delivered by railroad car to the transfer bridge on Pier "D," and, with a very short haul, moved to the storage yard, or directly under the cranes of the shop; or, material may be brought up by lighter to the lighter slip and then removed by the cantilever crane to the plate and shape storage yard or directly into the fabricating shop. The fabricating shop is so arranged that, by means of overhead cranes, raw material is taken into the shop and then handled throughout its course through the various shops by similar cranes; and in case it is to be used for ship-building, moved directly out to the ship-building shed under the crane serving the ship-building ways. The ship-building ways is partially enclosed, so that work may be carried on upon the ship under construction irrespective of weather conditions. Further, the ways itself is built in a permanent manner, to do away, once and for all, with the continual rebuilding of ship ways, which has been a marked feature of ship-building at this yard, and an item of expense that has inevitably been charged to the ship itself, then under construction. It is believed that, with those facilities for repair and building work, the economy brought about, if capitalized, would undoubtedly more than twice over pay for the cost of those facilities. No additional shops are shown for the Machinery Division, as it is well known that the shops already constructed at this yard for this division are commodious and economical in their arrangement, and can only be improved upon in small details. The shops are located conveniently to the dry docks and water-front. Extensions and additions may be required in the future, but will be of a minor order.

7. It is believed that the dry docks provided would easily serve

any call that would be made upon the yard for facilities of this character, and further statements with respect to their possible use are so self-evident as to be unnecessary of detailed explanation.

8. As will be seen, the wharf and slip arrangement of water-front improvement practically makes the entire yard an enclosed basin, which, while of course subject to tidal influence, will be almost entirely uninfluenced by the river currents. The slips are so located that, with perhaps two or three exceptions, entry or egress is readily obtained with very little assistance from tugs. The entry to the basin is of such width and so placed that it should be possible to bring a vessel into the slack-water basin without difficulty at any period of tide or current.

9. There is also submitted, marked Plate No. 9, a development of the navy yard, which, while it closely adheres to the shop and dry dock arrangements heretofore mentioned, corresponds more closely with the present water-front conditions of the yard; *i. e.*, the Ordnance Dock is retained. The length and depth of three slips from this Ordnance Dock to the East River is increased so that vessels will not overhang the end of the wharf at the prow or stern and be liable to accident by collision from passing craft. Two long slips are provided on the East River water-front to the west of the yard. The only objectionable feature of this plan is that it would be difficult to get vessels in or out of these slips, except with a condition of slack water in the East River. The plan has the advantage of less first cost, but its disadvantages, it is believed, more than outweigh this.

10. There is herewith given approximate estimate of cost of the suggestions contained in the six steps previously recited. It will be noted that this amount ($14,300,000) $1,862,500 is accounted for by the Hull Division shops and building slip, and $1,510,000 by storehouse and changes in the present storehouse to use it for the manufacture of clothing and storage of provisions. These two features can, of course, be eliminated from the plan if thought desirable. $5,500,000 is accounted for in the rebuilding of Dry Docks Nos. 2 and 3. It is understood that the rebuilding of these two docks is an inevitable necessity in the near future, if not exactly upon the lines laid down, upon some similar lines. The estimates for the docks, storehouse, Hull Division shops, together with the purchase of land perhaps of $1,200,000, amounts to

$10,072,500, leaving $4,227,500 remaining for the other improvements. Details are as follows:

FIRST INCREMENT.

SEE MAP PLATE NO. 1, ALSO STRUCTURAL DRAWING.

Standard gauge railroad track	$ 5,500	
Fabricating shed for C. & R. Dept., 350′ x 250′ x 100′ high, with transept 325′ x 100′ x 110′ high with mold loft	675,000	
Plate and shape furnaces, slabs, stack, etc.	20,000	
Equipment, cranes, etc.	50,000	
Dredging for extension of building ways No. 2	12,500	
Concrete and steel permanent ways	120,000	
Cart shed	2,000	
Rebuilding work on forge shop and steel foundry	25,000	
Required for public works, sewer, electric distribution, steam, salt and fresh water, air and telephone changes, etc.	50,000	
Crane shed over building ways, 160′ x 800′ x 200′ high 1 50-ton and two 10-ton cranes	960,000	
Dismounting and erecting cantilever crane in new position	18,000	
		$1,920,000

SECOND INCREMENT.

SEE MAP PLATE NO. 2, ALSO DESIGN FOR STOREHOUSE.

Standard-gauge railroad track	$ 3,500	
Crane track	6,500	
Fitting-up pier, 80′ wide, 650′ long	195,000	
Public works	50,000	
Storehouse for general storekeeper, 200′ x 550′, 8 floors	1,500,000	
Terminal car bridge and float guard	30,000	
Dredging basin to 35′ and removing Cob Dock	384,000	
		2,169,000

THIRD INCREMENT.

SEE MAP PLATE NO. 3.

Railroad and crane track	$ 30,000	
Lighter slip for steel stock yard	46,000	
Sea walls	96,000	
New Dry Dock No. 2, 140′ x 850′ x 35′ over sill	2,500,000	
Timber storage	50,000	
80,000 sq. ft. new piers	120,000	
Public works	100,000	
		2,942,000

FOURTH INCREMENT.

SEE MAP PLATE NO. 4.

Railroad and crane track	$ 30,000	
Dry Dock No. 3, 140′ x 1100′	3,000,000	
Public works	100,000	
		3,130,000

FIFTH INCREMENT.

SEE MAP PLATE NO. 5.

Railroad track	$ 10,000	
Piers and breakwater	800,000	
Sea wall	210,000	
Oil storage plant	100,000	
Coaling plant	300,000	
Public works	50,000	
Dredging	480,000	
Pattern storehouse	250,000	
		2,200,000

SIXTH INCREMENT.

SEE MAP PLATE NO. 6.

Purchase	$1,200,000	
Dredging	126,000	
Sea wall	222,000	
Retaining wall	200,000	
New residence for commandant	50,000	
Excavation	50,000	
Railroad track	31,000	
Fitting Building No. 126 for provision and clothing	10,000	
Public works	50,000	
		1,939,000
Total cost of improvements		$14,300,000

11. There is also submitted estimate of plan shown on Plate 9:

Standard-gauge railroad track	$ 65,000
Fabricating shed	675,000
Furnaces, slabs, stacks, etc.	20,000
Equipment of shed	50,000
Extension of building ways, dredging	12,500
Concrete and steel permanent ways	120,000
Cart shed	2,000
Rebuilding portion of forge shop and steel foundry	25,000
Public works	300,000
Crane shed over ways	960,000
Cantilever crane in stock yard	18,000
Fitting up pier	195,000

Storehouse for G. S. K.	$1,500,000
Terminal bridge, etc.	30,000
Dredging, pier slips, basin, etc.	944,000
Lighter slip	46,000
Sea walls	500,000
Dry Dock No. 2.	2,500,000
Timber storage shed	50,000
New piers	472,000
Crane track	36,500
Dry Dock No. 3.	3,000,000
Pattern storehouse	250,000
Retaining wall	150,000
Purchase to Hudson Avenue	1,200,000
Fitting up Building No. 126 for provision and clothing	10,000
Total	$13,131,000

12. In conclusion, we recognize that the great cost and length of time involved in the change probably makes the plan appear Utopian. In spite of this, we have been impelled to submit the suggestion for the following reasons:

Nearly half of this estimated cost is accounted for in the rebuilding of the two dry docks, which, it is well recognized, will have to be rebuilt in the near future; the ship-building feature of the Hull Division plant may be modified or omitted at the discretion of the Department, so as to show a large saving on this; the storehouse feature, while complete, and in a commercial sense justified, may be very much curtailed; and finally the cost to the Government of a new site for a navy yard of adequate size in the vicinity of New York, even admitting that such a site could be secured, would be so great, especially when provision is made for building new docks, wharves, shops and various other utilities, that in the end the plan suggested would be of much less first cost, besides which, it would, we are convinced, provide every facility and feature undoubtedly more satisfactorily than could be done by the purchase and development of any site in this locality that we know of.

13. From the above description of the various steps which are proposed for the rehabilitation of the New York Navy Yard, it will be noted that we have divided the work without reference to time, which would, of course, be contingent upon appropriations. It would be clearly recognized that a great deal of the work recommended can be proceeded with either as funds allow or as con-

venience dictates, and, in fact, practically no part of the work is contingent upon any other part. Roughly speaking, the project may be divided into the following parts:

First: Dry dock improvement.

Second: Water-front improvement.

Third: Storehouse improvement.

Fourth: Modern building for Hull Divisison work of manufacturing plant.

14. The bearing of the above remarks as to independence of work items will be recognized as clearly applying to the first three of the above divisions. As regards the fourth, we have not gone into detail, but we are prepared to outline a step-by-step program which could be adopted and which would allow the erection of the " fabrication shed " without interfering materially with the orderly progress of current yard work; and unless the output of the yard with regard to new ships were increased to one ship a year rather than one ship in two years, as at present, the new building slip arrangements could be carried out without interfering with the building program.

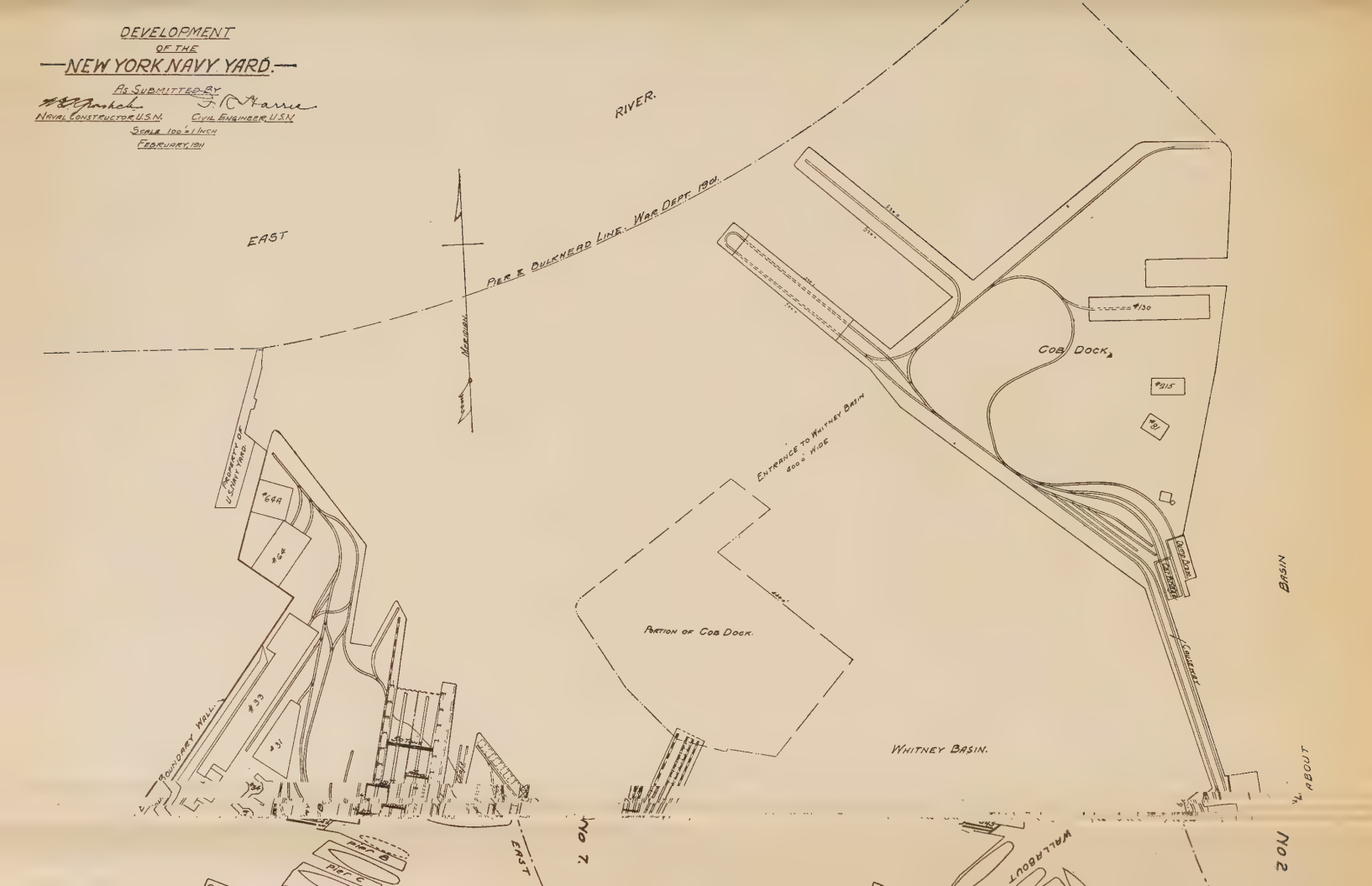
15. We believe that the interest of the Government would be best served if the various steps in the rehabilitation of the yard as indicated in sheets 1 to 6, inclusive, were appropriated for year by year, each yearly appropriation corresponding to the work indicated on the successive sheets.

16. A tabulation is herewith given for purposes of comparison, showing the lineal feet of berthing space, square feet of pier area, area of land, area of water, and area of docks of the navy yard in its existing condition, the navy yard as to be developed under the Rodgers Board plan, as developed under the plan proposed by Admiral Murdock and approved by the Department, and also plan herewith recommended, shown on Plate 6, and the alternate plan shown on Plate 9. The pier area includes, besides the actual areas of wharves, area of quays, obtained by the linear feet of quay wall by a depth of 50 feet.

Map	Area land acres	Area water acres	Area dock acres	Total area acres	Berthing lin. ft.	Pier area sq. ft.
Yard at present..	120	69	5	194	10,635	426,500
Rodgers Board..	135	67	5	207	16,365	671,925
Admiral Murdock	112	77	5	194	14,400	565,000
Plate 6, plan rec..	111	85	9	207	23,750	948,500
Plan 9, alt. plan...	113	87	9	207	22,500	875,500

17. The entire area of the present property, including land and water, is 194 acres, and including the so-called Hudson purchase, 207 acres. It will be noted that the plan recommended herewith, shown on Plate 6, gives the maximum berthing space and pier area, being for the berthing space approximately 125 per cent in excess of that at present provided, 40 per cent in excess of the Rodgers Board, and nearly 60 per cent in excess of the plan proposed by Admiral Murdock. In general, the pier area shows the same increase over existing conditions and the two plans proposed and referred to herein.

18. The fact must not be overlooked that our primary intention is not to lay down in detail, or even in anything but on very broad lines, the development of the present site, but merely to show that it is both possible and practicable to develop the present yard, with a reasonable cost, into a most satisfactory, efficient, and comprehensive naval establishment for the repair, and if necessary the building, of vessels of war, with due regard to the fact that the New York Navy Yard has been in the past, and will probably continue to be in the future, the yard upon which the greatest demands are made in connection with the efficiency of the fleet.


DEVELOPMENT
OF THE
NEW YORK NAVY YARD.
AS SUBMITTED BY
NAVAL CONSTRUCTOR U.S.N.
CIVIL ENGINEER U.S.N.
SCALE 100' = 1 INCH
FEBRUARY 1911
RIVER.
EAST
PIER E BULKHEAD LINE. WAR DEPT. 1901.
MEREWAY
PROPERTY OF U.S. NAVY YARD
#69A
#64
#33
#31
BOUNDARY WALL
PIER A
PIER C
ENTRANCE TO WHITNEY BASIN 400.0' WIDE
PORTION OF COB DOCK.
COB DOCK
#130
#215
#51
DRY DOCK
CAISSON
CONCRETE
WHITNEY BASIN.
WALLABOUT
BASIN
EAST
NO 2
NO 2

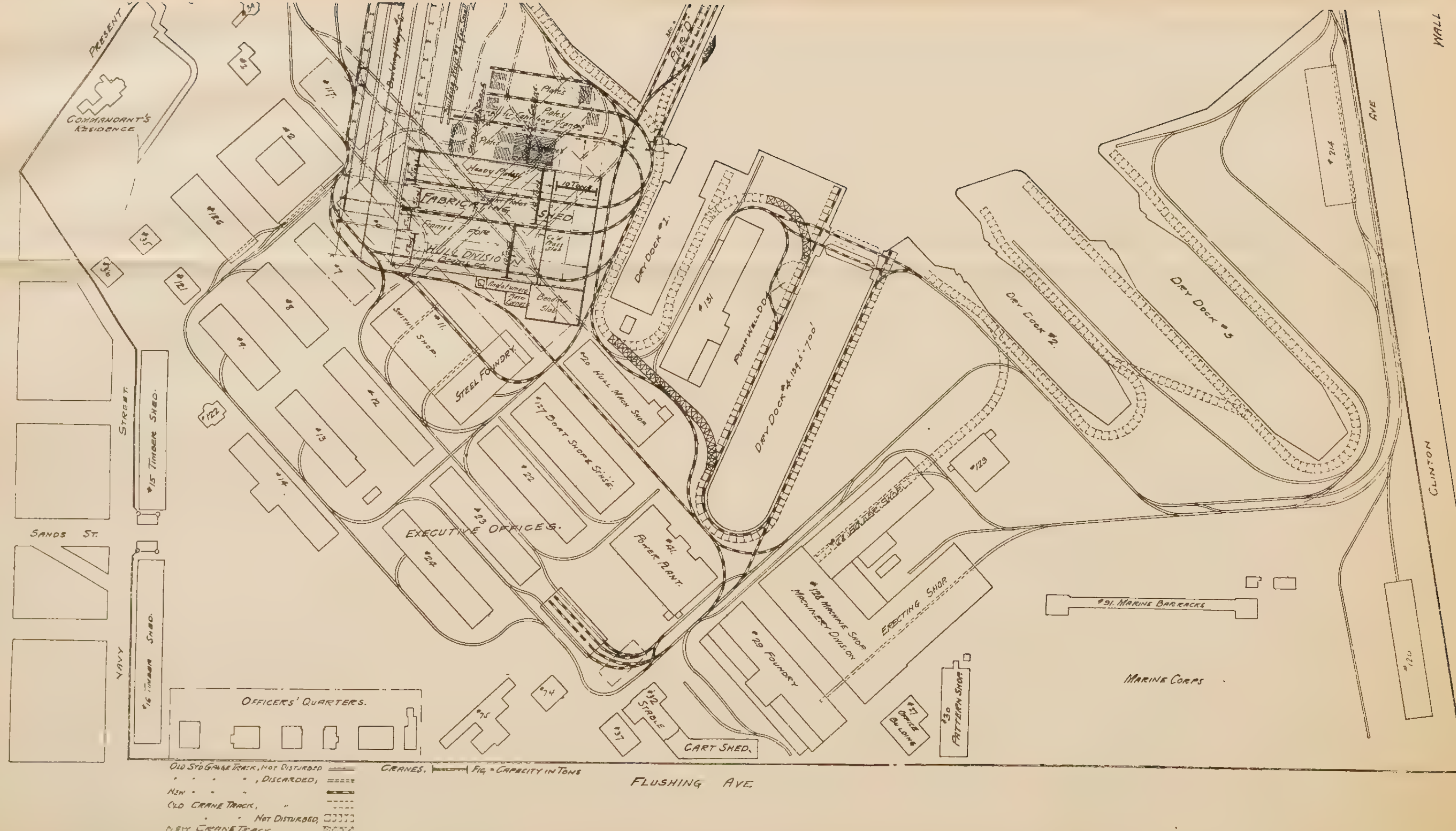

WALL
AVE
CLINTON
#214
#120
DRY DOCK #3
DRY DOCK #2.
DRY DOCK #2.
DRY DOCK #4. 1395'-700'
PUMP WELL DD#4
#131
DRY DOCK #1.
PIER D.
#91. MARINE BARRACKS
MARINE CORPS
#123
#30 PATTERN SHOP
#27 OFFICE BUILDING
ERECTING SHOP
#128 MACHINE SHOP MACHINERY DIVISION
#29 FOUNDRY
CART SHED.
#32 STABLE
#37
#41. POWER PLANT.
#20 HULL MACH SHOP
#127 BOAT SHOP & STHSE.
#22
#23
EXECUTIVE OFFICES.
#24
#74
#75
FABRICATING SHED
HULL DIVISION
Heavy Plates
Plates
Frames
Bending Slab
10 Tons
STEEL FOUNDRY.
#11. SMITH SHOP.
#12
#13
#14.
#7
#8
#9.
#2
#117.
#126
#121
#122
#35
#36
#3
COMMANDANT'S RESIDENCE
PRESENT
SANDS ST.
STREET
NAVY
#15 TIMBER SHED.
#16 TIMBER SHED.
OFFICERS' QUARTERS.
FLUSHING AVE
OLD STD GAUGE TRACK, NOT DISTURBED
" " " , DISCARDED,
NEW " "
OLD CRANE TRACK, "
" " NOT DISTURBED,
NEW CRANE TRACK.
CRANES. Fig = CAPACITY IN TONS

PLATE 1

DEVELOPMENT OF THE NEW YORK NAVY YARD.

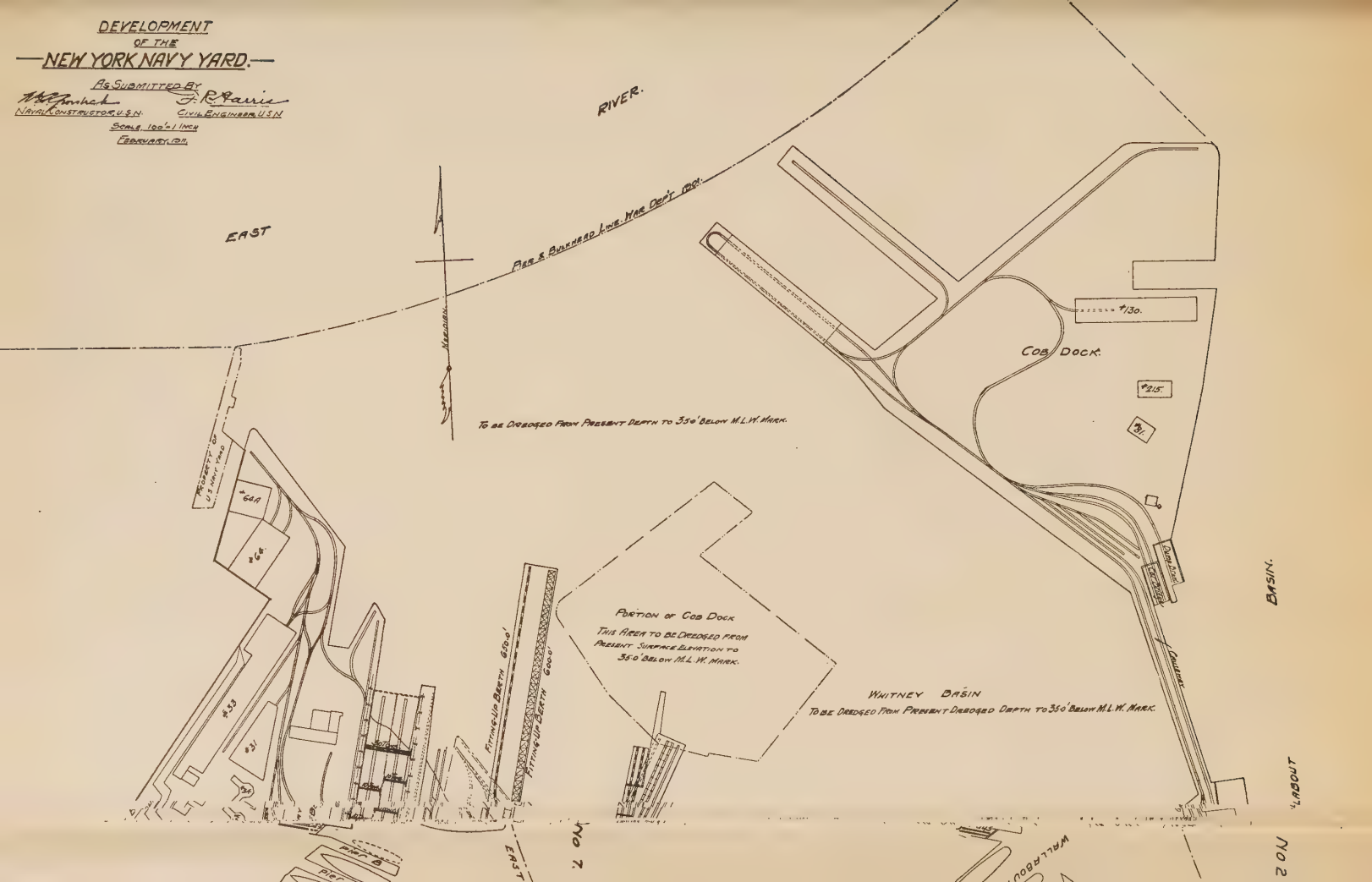
As Submitted By

F. R. Harris
Civil Engineer, U.S.N.

Naval Constructor, U.S.N.

Scale, 100' = 1 Inch

February, 1911.



Dry Dock #3.
Dry Dock #2.
Dry Dock #4. 1395'×700'
Dry Dock #1
#214
#120
#125.
#131.
#91. Marine Barracks.
Marine Corps
#28 Boiler Shop.
Erecting Shop.
#128. Machine Shop
Machinery Division
#23. Foundry.
#30 Pattern Shop
#27 Office Building.
#41. Power Plant.
#20 Hull Machine Shop.
#127. Boat Shop & Storehouse.
#22
#23
#24
Steel Foundry
#11. Smith Shop.
Fabricating Shop
Hull Division
New General Storehouse.
8 Floors in Height.
#14
#2
#1
#126
#121
#122
#35
#34
Commandant's Residence.
#15. Timber Shed.
#16 Timber Shed
Officers' Quarters.
#38 Stable
#37
Cart Shed
#74
#75
Clinton Ave.
Wal
Flushing Ave.
Sands St.
Navy St.
Old Std Gauge Track, Not Disturbed,
" " " " Discarded,
New " " "
Old Crane Track "
" " Not Disturbed,
New Crane Track.
Cranes
Fig. = Capacity in Tons

PLATE 2

DEVELOPMENT OF THE —NEW YORK NAVY YARD.—

As Submitted By

Naval Constructor U.S.N. — Civil Engineer, U.S.N.

Scale 100' 1 Inch.

February 1911.

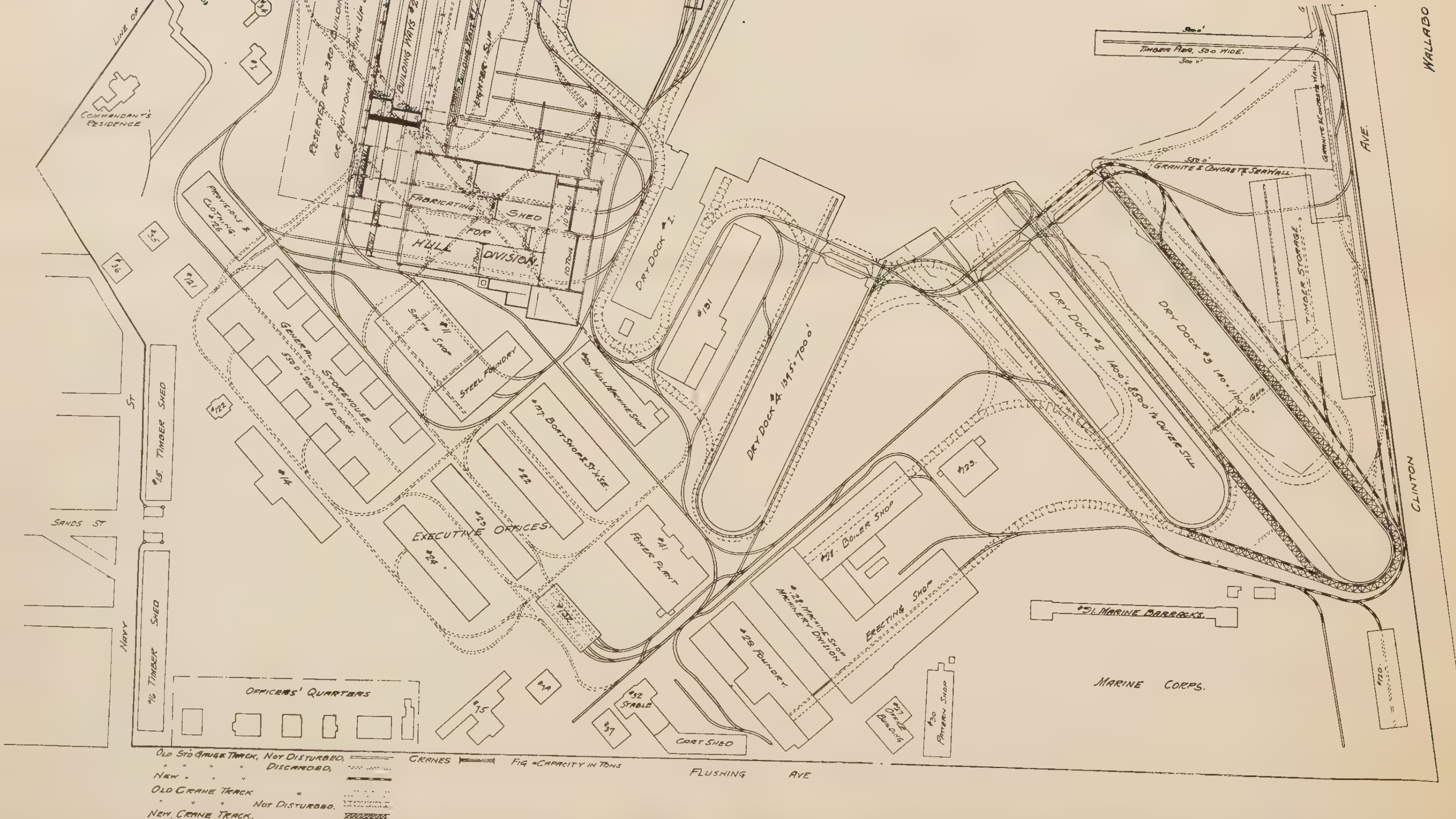

WALLABO
AVE.
CLINTON
TIMBER PIER, 500 WIDE.
GRANITE & CONCRETE SEAWALL
TIMBER STORAGE
DRY DOCK #3 140 × 1100'
DRY DOCK #2 1400' & 850.0' to OUTER SILL
DRY DOCK #4 139.5' × 700.0'
DRY DOCK #1.
#131
#123.
#21. BOILER SHOP
ERECTING SHOP
#28. MACHINE SHOP MACHINERY DIVISION
#29 FOUNDRY.
#51. MARINE BARRACKS.
MARINE CORPS.
#120.
#30 PATTERN SHOP
#27 OFFICE BUILDING
#32 STABLE
CART SHED
#41 POWER PLANT
#20. HULL MACHINE SHOP
#127. BOAT SHOP & ST'H'SE.
#22
#23
#24
EXECUTIVE OFFICES
#132
#75
#11 SMITH SHOP
STEEL FOUNDRY
FABRICATING SHED FOR HULL DIVISION
10 TONS
5 TONS
LIGHTER SLIP
BUILDING WAYS
RESERVED FOR 3RD BUILDING OR ADDITIONAL FITTING-UP
GENERAL STOREHOUSE 550.0' × 200.0' × 8 FLOORS.
#14
PROVISIONS & CLOTHING. #126
#121
#122
#35
#36
COMMANDANT'S RESIDENCE
LINE OF
#15. TIMBER SHED
#16 TIMBER SHED
OFFICERS' QUARTERS
ST
SANDS ST
NAVY
FLUSHING AVE
OLD STD GAUGE TRACK, NOT DISTURBED,
DISCARDED,
NEW
OLD CRANE TRACK
NOT DISTURBED.
NEW. CRANE TRACK.
CRANES
FIG = CAPACITY IN TONS

PLATE 3

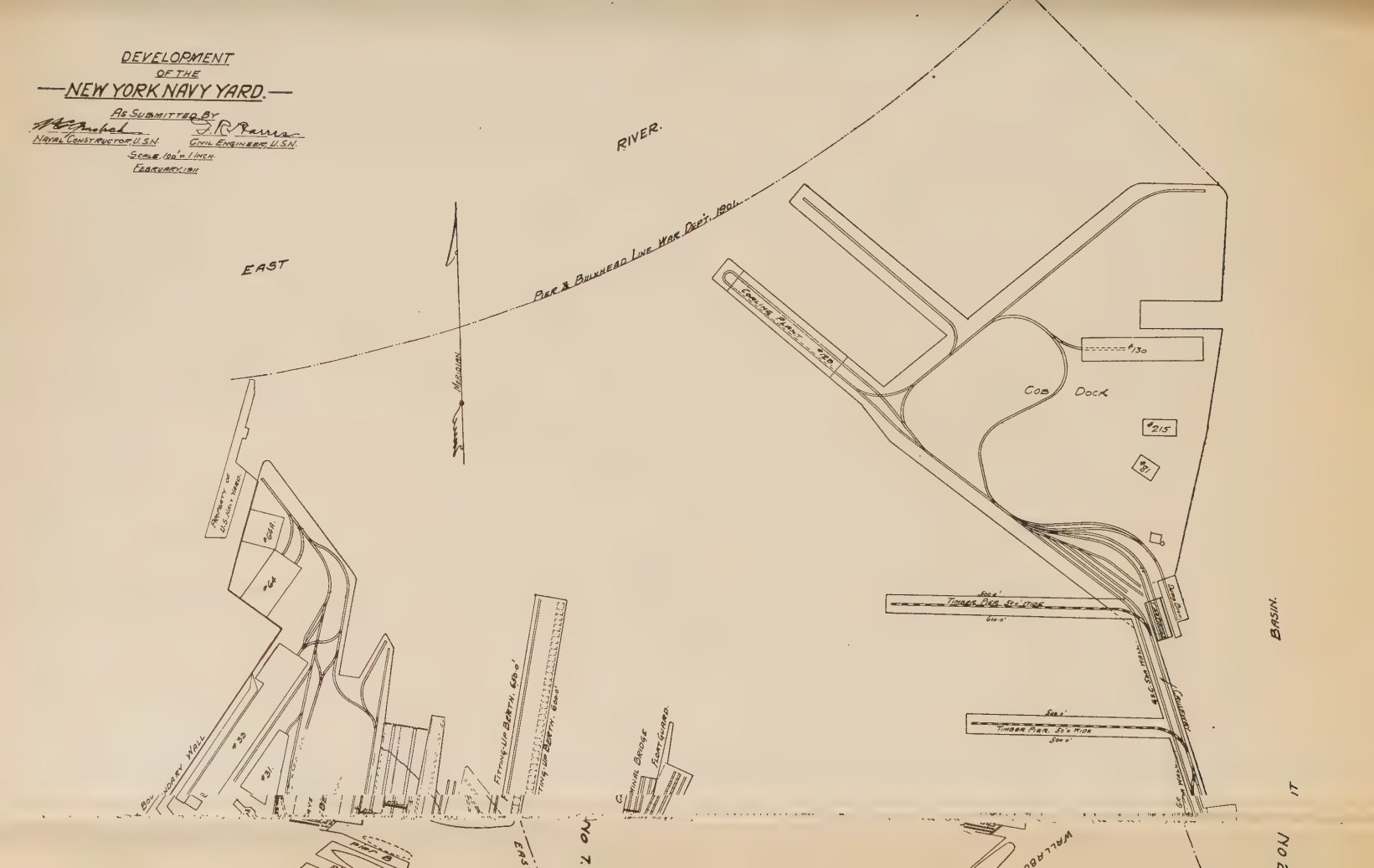
DEVELOPMENT OF THE NEW YORK NAVY YARD.

As Submitted By

Naval Constructor U.S.N. — Civil Engineer, U.S.N.

Scale, 100' = 1 Inch.

February 1911



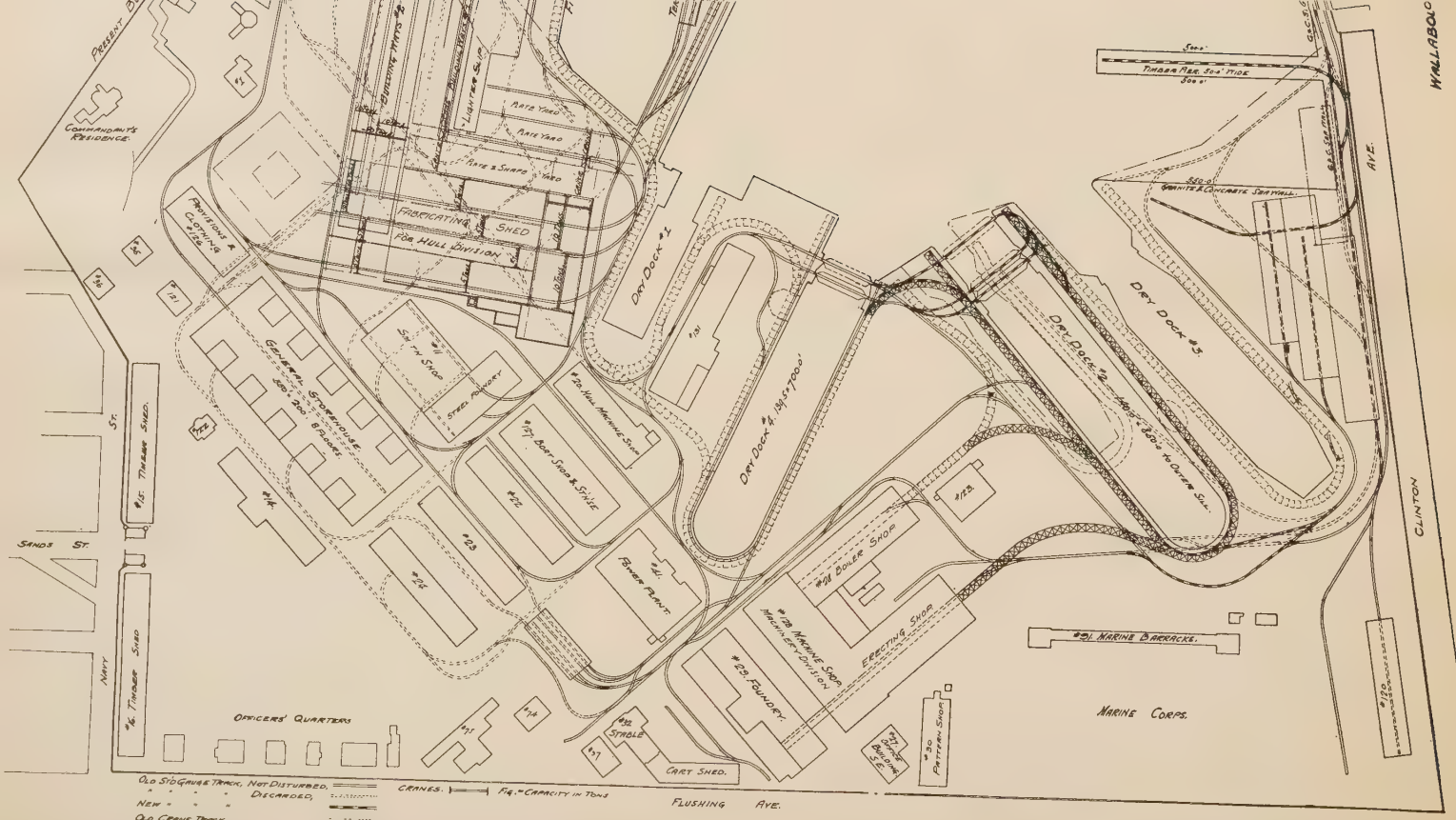
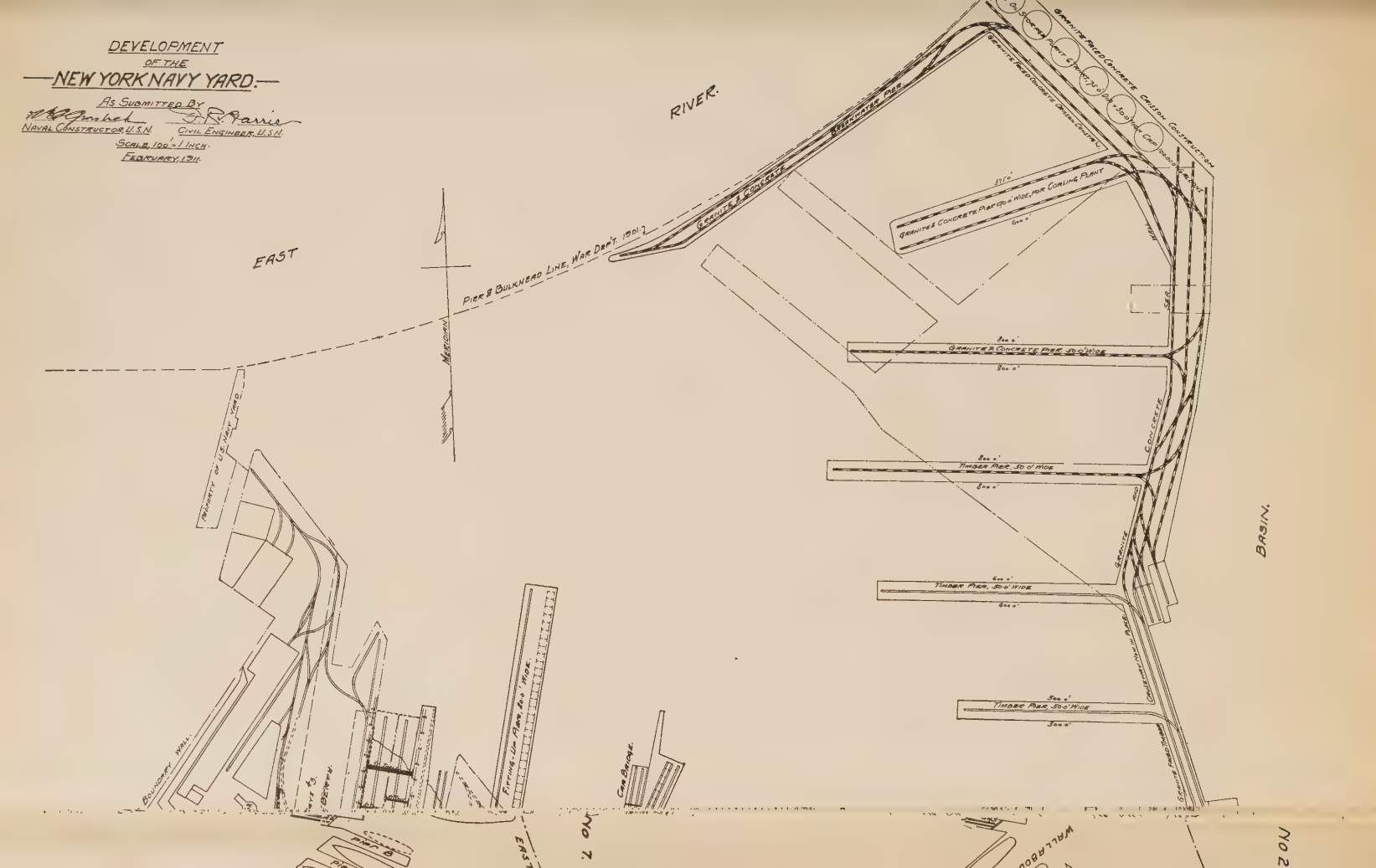

Commandant's Residence
Present Boundary
Provisions & Clothing
Fabricating Shed
For Hull Division
Building Ways
Light for Slip
Plate Yard
Plate Yard
Plate & Shapes Yard
Dry Dock #2
Dry Dock #1, 154'x700'
Dry Dock #3
Dry Dock #2, 140'x 600' to Outer Sill
Timber Rak. 500' Wide
300'
Stone
Granite & Concrete Seawall
Bag Seawall
Wallabout
Ave.
Clinton
Steel Pontoon
Saw Mill Shop
#17 Boat Shop & Stable
For Hull Machine Shop
#22
#23
#24
#25
#26
#27 Boiler Plant
#28 Boiler Shop
#29 Machine Shop Machinery Division
#123
#31 Erecting Shop
#32 Stable
#33 Cart Shed
#34 Boiler Shop
#30 Pattern Shop
#31 Marine Barracks
#120
#1 Timber Shed
#4 Timber Shed
#14
#15
#16
#17
#18
#19
#20
#21
#22
#23
#24
#25
#26
#27
#28
#29
#30
#31
#32
#33
#34
#120
#123
General Storehouse 200' Deep 6 Floors
Officers' Quarters
Marine Corps.
Navy
Sands St.
Flushing Ave.
Old Std Gauge Track, Not Disturbed, Discarded,
New " " " "
Old Crane Track " " "
New Crane Track " " "
Not Disturbed,
Cranes: Fig.= Capacity in Tons

PLATE 4


DEVELOPMENT
OF THE
NEW YORK NAVY YARD.
As Submitted By
H. A. Gilmer
Naval Constructor, U.S.N.
J. R. Parris
Civil Engineer, U.S.N.
Scale, 100 = 1 Inch.
February, 1911.
EAST
RIVER.
Pier & Bulkhead Line, War Dep't. 1901.
Granite & Concrete
Granite & Concrete Wharf
Granite & Concrete Pier 50'0" Wide for Coaling Plant
Granite & Concrete Pier 50'0" Wide
Timber Pier, 50'0" Wide
Granite
Concrete
Timber Pier, 50'0" Wide
Timber Pier, 50'0" Wide
Granite Faced Concrete Caisson Construction
Granite Faced Concrete Caisson Construction
Property of U.S. Navy Yard
Boundary Wall
Fitting Out Pier No. 1 Wide
Car Bridge
Basin
No 2
No 7
Wallabout

COMMANDANT'S RESIDENCE.
CRANES FOR BUILDING OR REPAIRING VESSELS
#136
#135
#134
#133
#132
#131
#130
#129
#128
#127
#126
#125
#124
#123
#122
#121
#120
#119
#118
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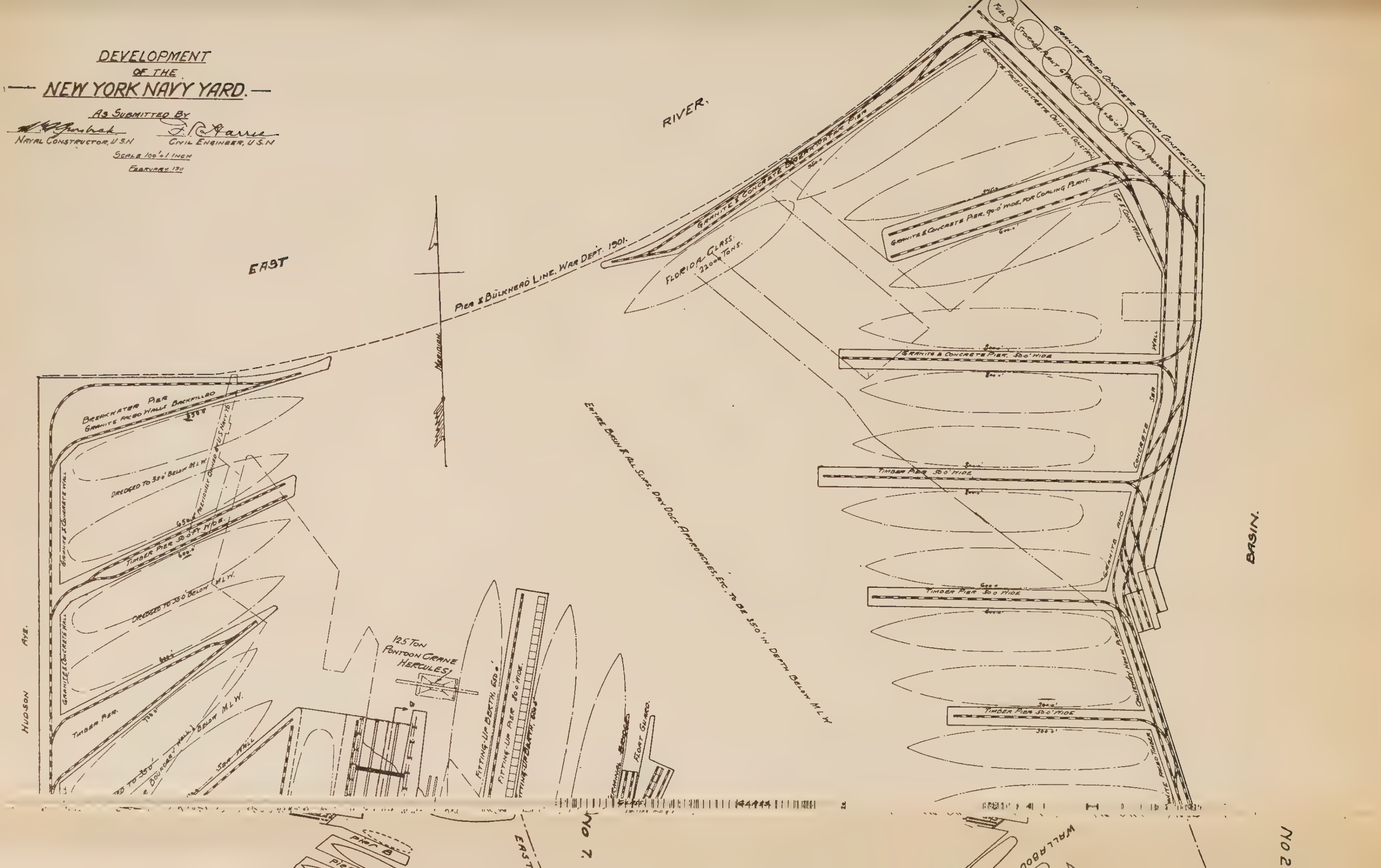
#14
#13
#12
#11
#10
#9
#8
#7
#6
#5
#4
#3
#2
#1
Boiler & Caulking Shops
Frame Setting Shed
Fitting Shop
HULL DIVISION
Dry Dock #1
Dry Dock #2. 1895. 700' x 90'
New Dry Dock #3. 140' x 650'
New Dry Dock #4. 140' x 650'
Timber Pier, 50' Wide
300'
350'
Granite & Concrete Sea Wall
Timber Storage
Clinton Ave
Wallabout
#1 Boiler Shop
Steel Building
#2 Hull Working Shop
#3 Boat Dept & Storehouse
Storehouse, General Stores, 300' x 4 Floors
#4 Timber Shed
Sands St.
Executive Offices.
Pioneer House
#5 Boiler Shop
#6 Machine Shop Machinery Division Erecting Shop
#7 Foundry
#8 Timber Shed
Navy
Officers' Quarters.
Pattern Storehouse
#9 Stable
#10 Boiler Shop
#11 Pattern Shop
#12 Marine Barracks.
Marine Corps
Flushing Ave.
Old Std Gauge Track, Not Disturbed.
" " " Discarded.
New " " "
Old Crane Track "
" " " Not Disturbed.
New " "
Cranes, Fig. = Capacity in Tons.

PLATE 5


DEVELOPMENT
OF THE
NEW YORK NAVY YARD.
As Submitted By
Naval Constructor, U.S.N
Civil Engineer, U.S.N
Scale 100' = 1 Inch
February 1911
EAST
RIVER.
Pier & Bulkhead Line. War Dept. 1901.
Meridian
Florida Class. 22000 Tons.
Granite Faced Concrete Caisson Construction.
Granite Faced Concrete Caisson Constr.
Granite & Concrete Pier, 90.0' wide, for Coaling Plant.
Gr. & Conc. Wall
Granite & Concrete Pier. 300' wide
Timber Pier 300' wide
Timber Pier 300' wide
Timber Pier 300' wide
Entire Basin & All Slips, Dry Dock Approaches, Etc. to be 35.0' in Depth Below M.L.W.
Breakwater Pier Granite Faced Walls Backfilled
Dredged to 35.0' Below M.L.W.
Timber Pier 300 ft wide
Granite & Concrete Wall
Timber Pier
125 Ton Pontoon Crane Hercules.
Fitting-Up Berth, 650'
Fitting-Up Pier 800' wide
Float Guard.
Hudson Ave.
BASIN.
No 7.
No 2
Wallabout
East

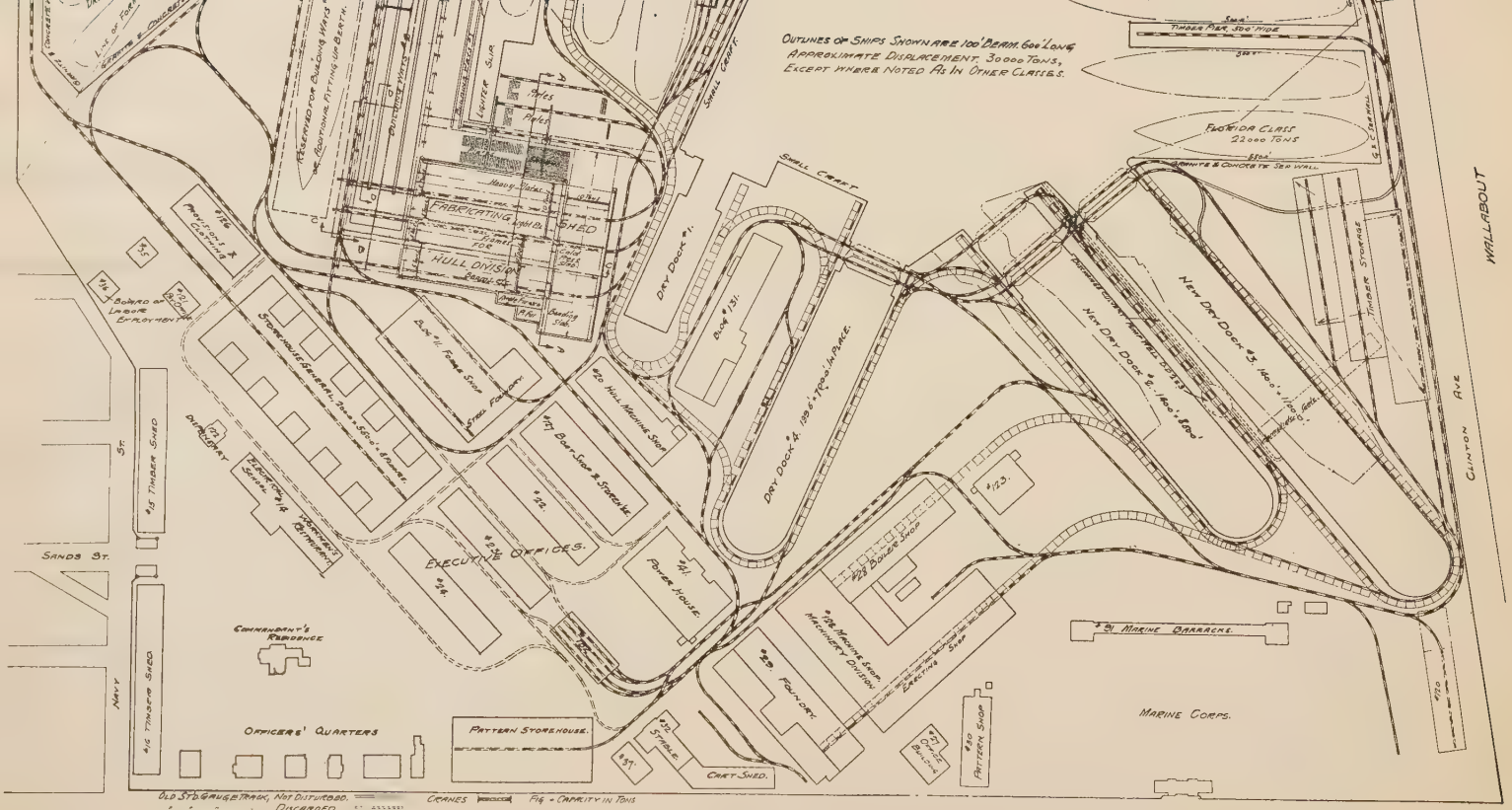

OUTLINES OF SHIPS SHOWN ARE 100' BEAM, 600' LONG
APPROXIMATE DISPLACEMENT, 30000 TONS,
EXCEPT WHERE NOTED AS IN OTHER CLASSES.
FLORIDA CLASS
22000 TONS
RESERVED FOR BUILDING WAYS & ADDITIONAL FITTING UP BERTH.
FABRICATING SHED
HULL DIVISION
DRY DOCK #1.
DRY DOCK #3.
DRY DOCK #4
139.6' x 700' in PLACE.
NEW DRY DOCK #5, 140' x 1150' x 60'
NEW DRY DOCK #6, 140' x 800'
#20 Hull Machine Shop
#22 Boat Shop & Storehouse
#22½ EXECUTIVE OFFICES.
#24 Power House
#23 Boiler Shop
#28 Machine Shop Machinery Division
#29 Foundry
#30 Erecting Shop
#31 Pattern Shop
#32 Oil Building
#37 Stable
#38 Craft Shed
#51 Marine Barracks
#123
#15 Timber Shed
#16 Timber Shed
#17 Timber Shed
#18 Timber Storage
#170
#174 Commandant's Residence
#175 Officers' Quarters
#176 Pattern Storehouse
#177 Receiving Station
#178 Board of Labor Employment
#179 Provost & Clothing
#180 Boat & Forge Shop
#181 Storehouse & Paint Shop
Navy Yard Wall
Timber Storage
Sands St.
Flushing Ave
Clinton Ave
Wallabout
Marine Corps.
Old Std. Gauge Track, Not Disturbed.
" " " Discarded.
New " " "
Old Crane Track "
" " " Not Disturbed.
New Crane Track
Cranes Fig. = Capacity in Tons

PLATE 6

DEVELOPMENT OF THE — NEW YORK NAVY. YARD. —

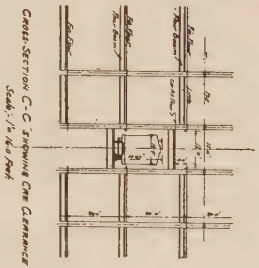
As Submitted By

P. H. Graham
Naval Constructor, U.S.N.

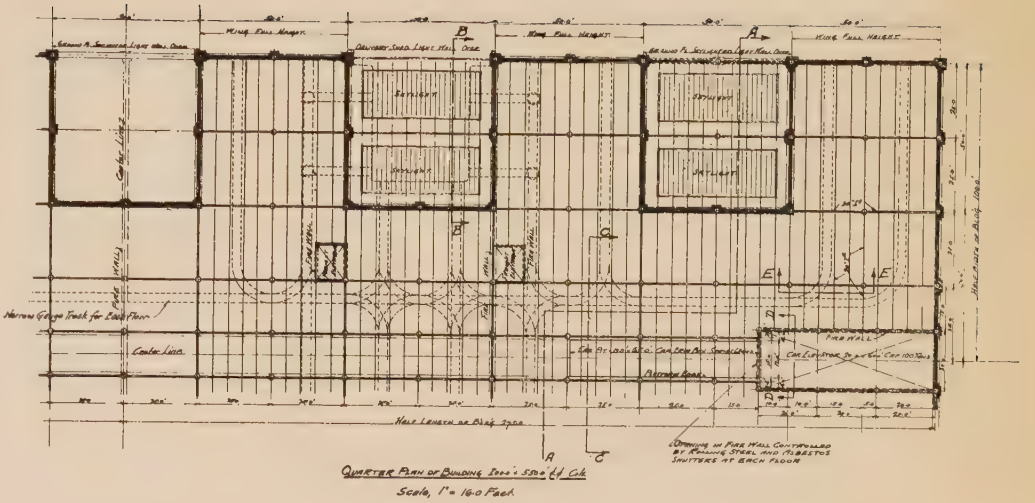
C. C. Parris
Civil Engineer, U.S.N.

Scale, 100'= 1 Inch

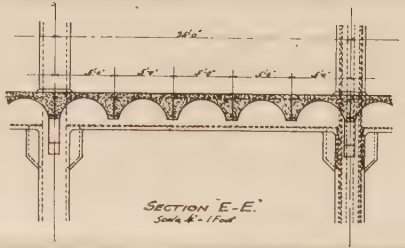
February 1911



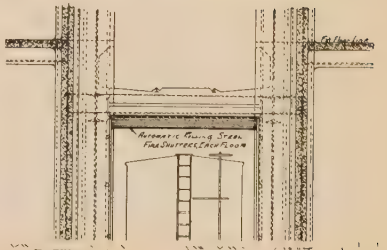
Cross-Section C-C showing Car Clearance
Scale 1/8" = 1 Foot

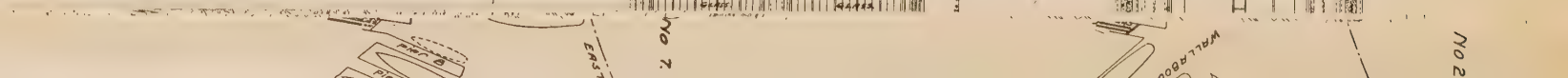

Narrow Gauge Track for Each Floor
Center Line
Fire Wall
Fire Wall
Length of Building 1200 Ft.
Automatic Rolling Steel Fire Shutters at Each Floor

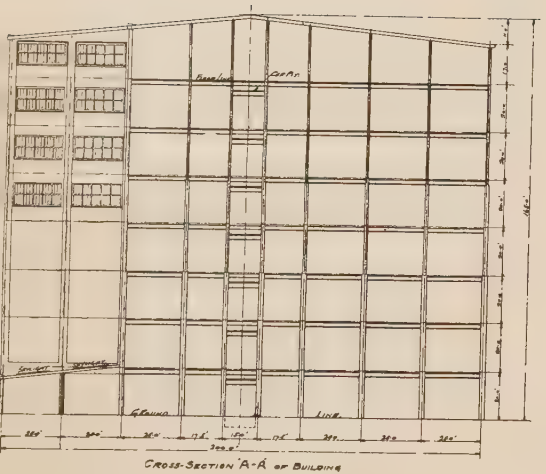
Quarter Plan of Building 1200 x 520 Ft. Ctr. Ctr.
Scale, 1" = 160 Feet



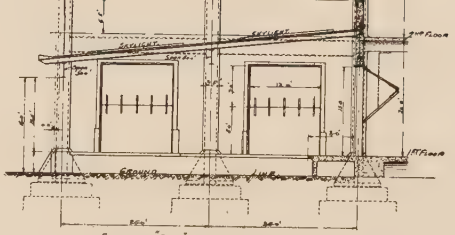
Section "E-E."
Scale 1/8" = 1 Foot



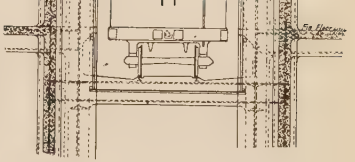




Cross-Section 'A-A' of Building
Scale 1"=200



Section 'B-B' through Delivery Shed
Also showing Concentrator Gangway Details.
Scale 1"=8 Ft.



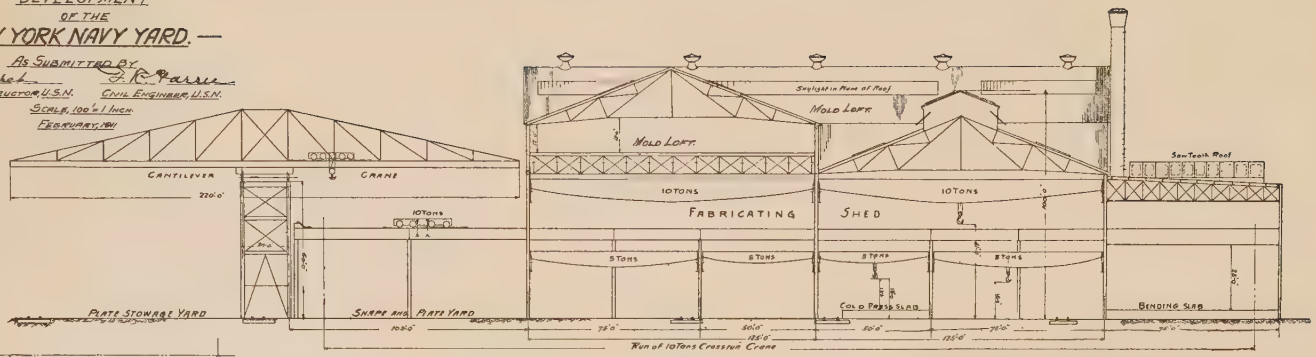
Section 'D-D'
Showing Ore Elevator Hole & Pit
Scale, 4"=1 Foot.

PLATE 7

DEVELOPMENT OF THE NEW YORK NAVY YARD.

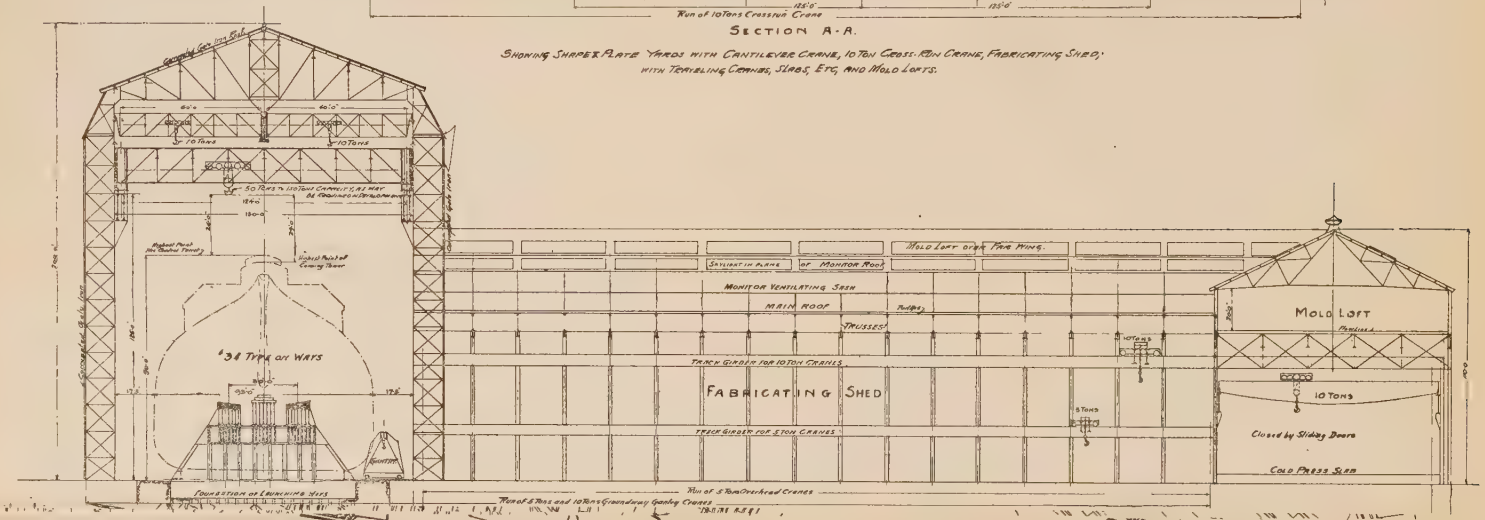
As Submitted By
H. H. Bouker, Naval Constructor, U.S.N.
J. R. Parris, Civil Engineer, U.S.N.

Scale, 100 ft. = 1 Inch.
February, 1911



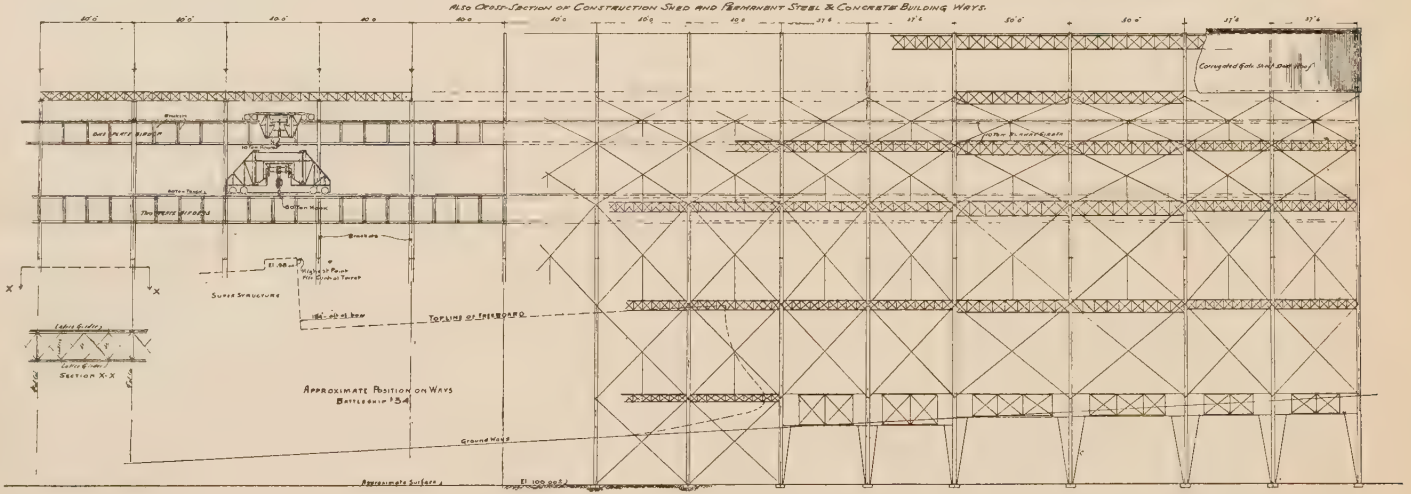
SECTION A-A.

Showing Shape & Plate Yards with Cantilever Crane, 10 Ton Cross-Run Crane, Fabricating Shed, with Travelling Cranes, Slabs, Etc, and Mold Lofts.


Mold Loft over Two Mens.
Skylight in Plane of Monitor Roof
Monitor Ventilating Sash
Main Roof
Trusses
Track Girder for 10 Ton Cranes
Fabricating Shed
Track Girder for 5 Ton Cranes
Mold Loft
10 Tons
Closed by Sliding Doors
Cold Press Slab
38 Type of Ways
Foundation of Launching Ways
Run of 5 Ton and 10 Ton Gronndway Gantry Cranes
Run of 5 Ton Overhead Cranes

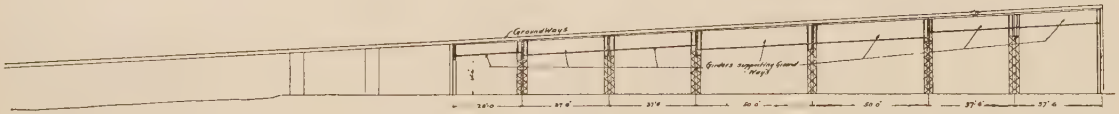
SECTION C-C

LONGITUDINAL SECTION OF FABRICATING SHED, SHOWING CRANE RUNS, TRANSEPT, MOLD LOFT, TRANSFER GANTRY CRANES, ETC.
ALSO CROSS-SECTION OF CONSTRUCTION SHED AND PERMANENT STEEL & CONCRETE BUILDING WAYS.



SECTION B-B

LONGITUDINAL SECTION OF CONSTRUCTION SHED, AND PERMANENT BUILDING WAYS, SHOWING POSITION OF BATTLESHIP ON WAYS, AND CLEARANCES OF TRAVELING CRANES OVER THE SHIP.



SECTION D-D

SIDE VIEW OF CONCRETE AND STEEL PERMANENT BUILDING WAYS.

PLATE 8

DEVELOPMENT OF THE NEW YORK NAVY YARD.

ALTERNATE PLAN.

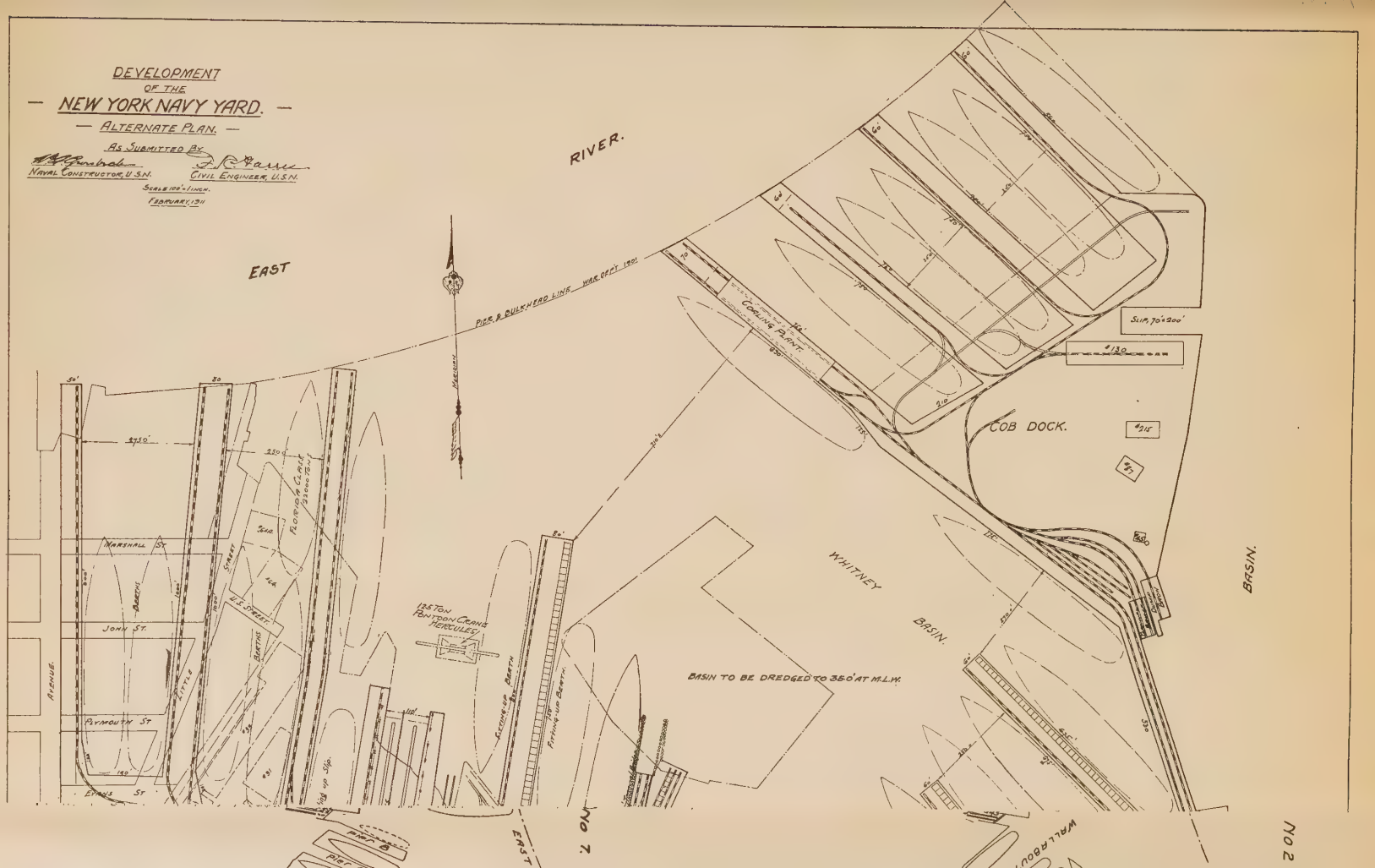
AS SUBMITTED BY

[illegible]
NAVAL CONSTRUCTOR, U.S.N.

[illegible]
CIVIL ENGINEER, U.S.N.

SCALE 100'-1 INCH.

FEBRUARY, 1911



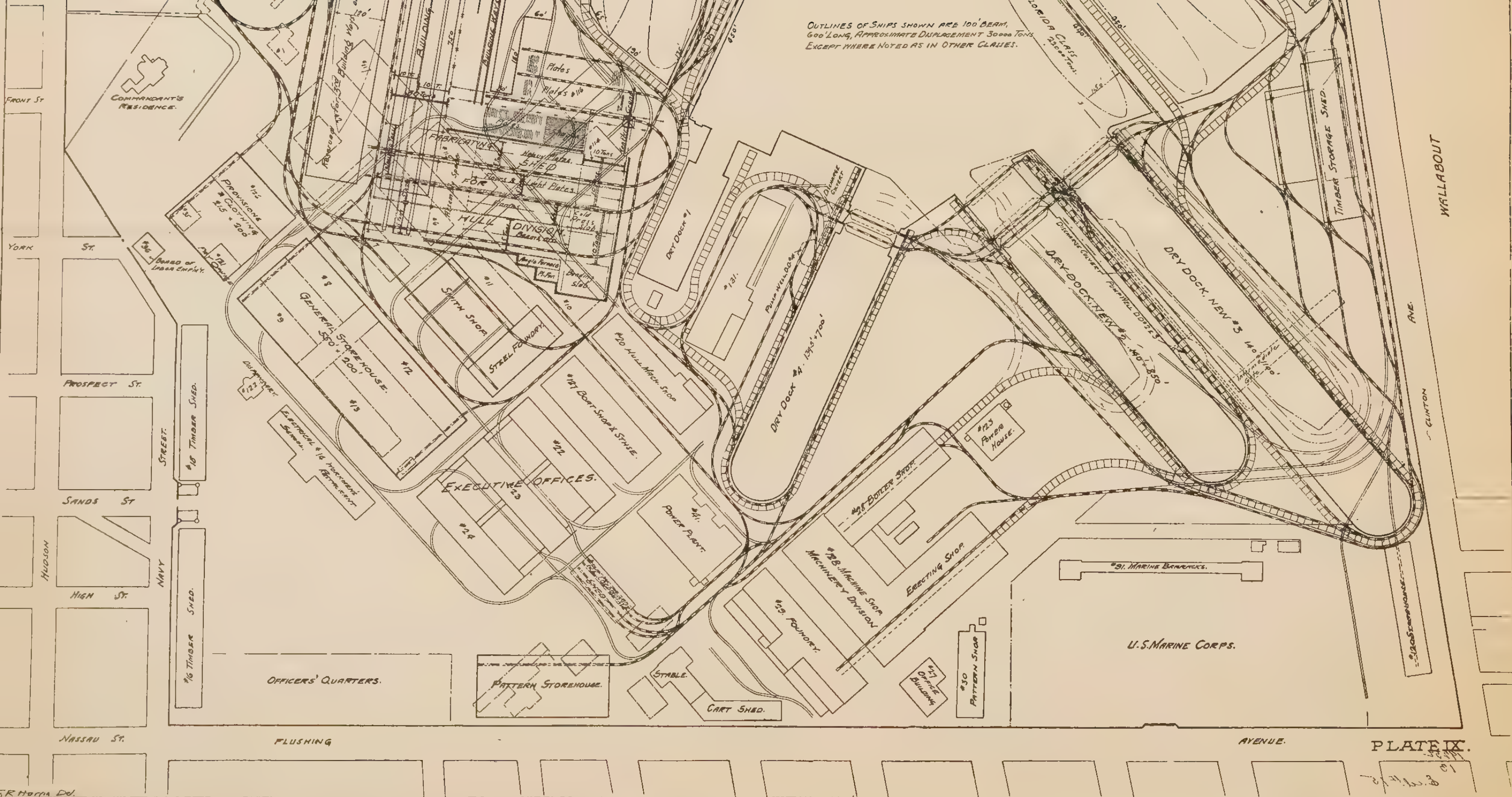


PLATE IX.
OUTLINES OF SHIPS SHOWN ARE 100' BEAM, 600' LONG, APPROXIMATE DISPLACEMENT 30000 TONS EXCEPT WHERE NOTED AS IN OTHER CLASSES.
FLORIDA CLASS 22000 TONS.
WALLABOUT
CLINTON AVE.
TIMBER STORAGE SHED.
DRY DOCK, NEW #3 140' x 1100'
DRY DOCK, NEW #2 140' x 850'
DISCHARGE CULVERT
PUMPWELL DOCKS 2 & 3
#123 POWER HOUSE.
DRY DOCK #4. 134½' x 700'
PUMP WELL D.D. #4
DISCHARGE CULVERT
#131.
DRY DOCK #1
#120 STOREHOUSE
#91. MARINE BARRACKS.
U.S. MARINE CORPS.
AVENUE.
#30 PATTERN SHOP
#27 OFFICE BUILDING
#28 BOILER SHOP
ERECTING SHOP
#128 MACHINE SHOP MACHINERY DIVISION
#29. FOUNDRY.
CART SHED.
STABLE.
#41. POWER PLANT.
#20 HULL MACH. SHOP
#127 BOAT SHOP & STHSE.
#22
EXECUTIVE OFFICES.
23
#24
PATTERN STOREHOUSE.
OFFICERS' QUARTERS.
FLUSHING
STEEL FOUNDRY
SMITH SHOP
#11
#10
HULL DIVISION
FABRICATING SHED FOR
Plates
Light Plates
Heavy Plates
BUILDING WAYS
GENERAL STOREHOUSE. 550' x 200'
#8
#9
#12
#13
ELECTRICAL #16 WORKMEN'S RESTAURANT SCHOOL.
DISPENSARY. #122
PROVISIONS & CLOTHING 215 x 200
#35
#121 PAY OFFICE
#36 BOARD OF LABOR EMPLOY.
COMMANDANT'S RESIDENCE.
#18 TIMBER SHED.
#16 TIMBER SHED.
STREET.
NAVY
FRONT ST
YORK ST.
PROSPECT ST.
SANDS ST
HIGH ST.
HUDSON
NASSAU ST.
E.R. Morris Del.

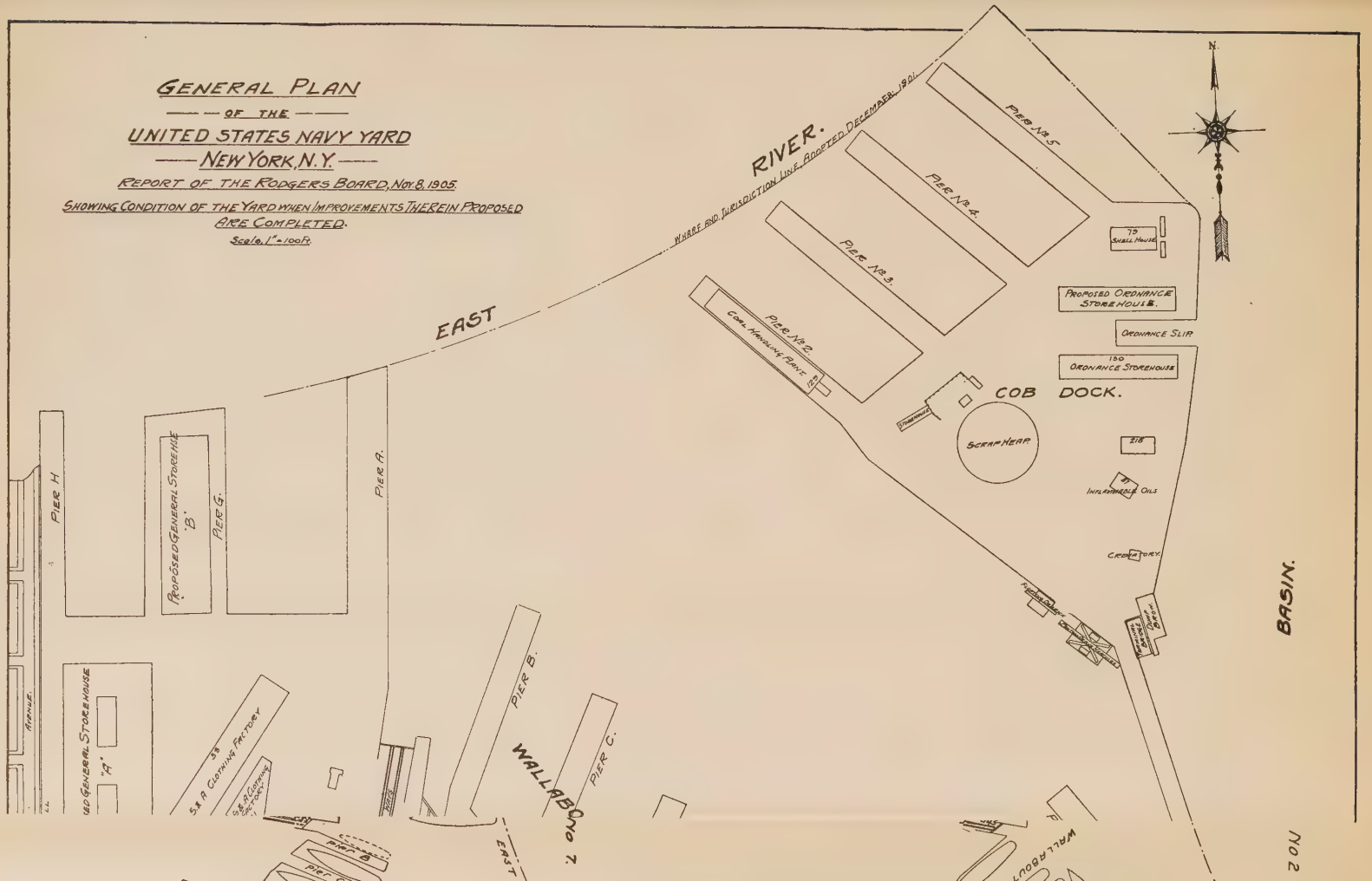
PLATE 9

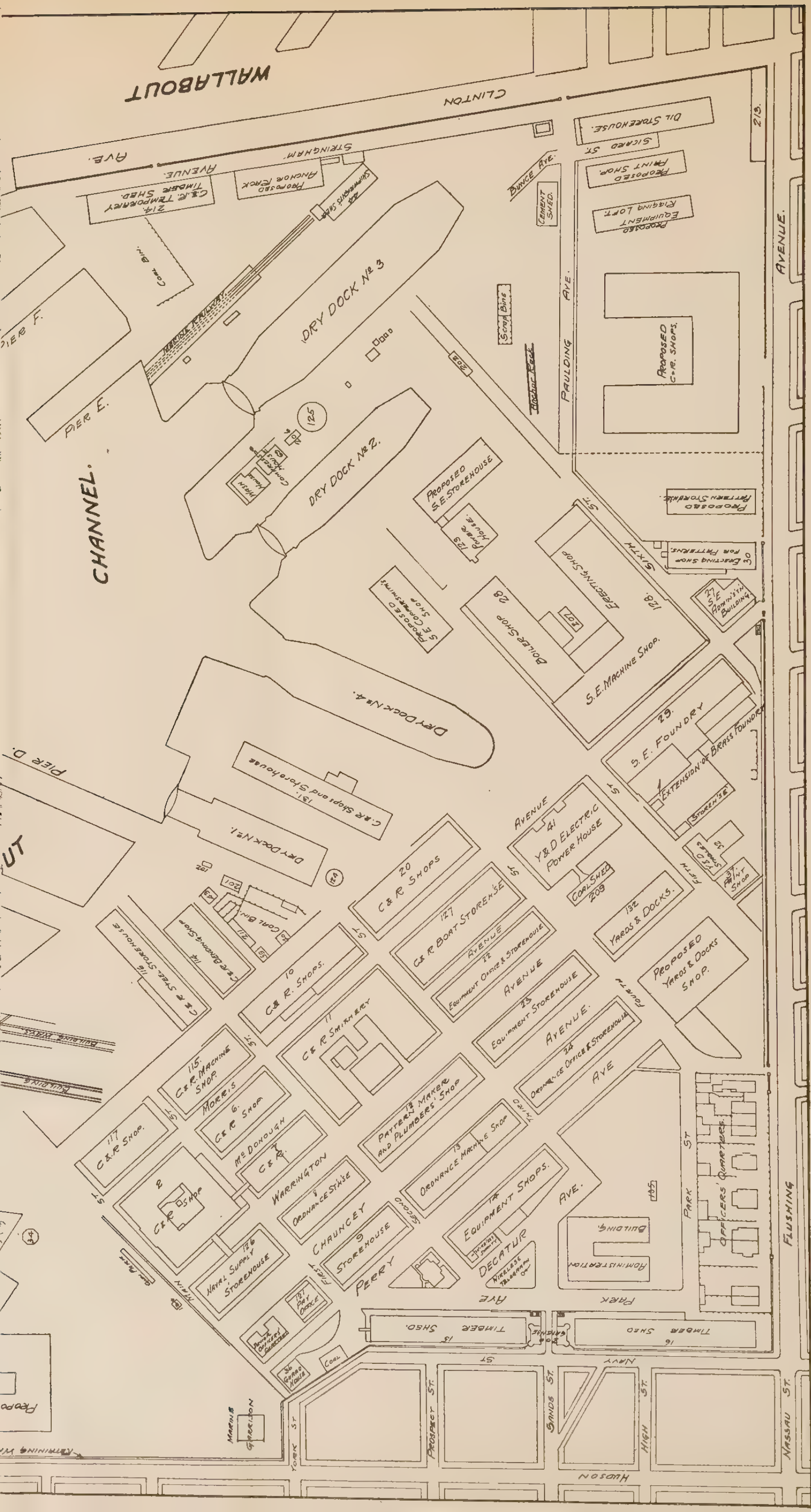
GENERAL PLAN
OF THE
UNITED STATES NAVY YARD
NEW YORK, N.Y.

REPORT OF THE RODGERS BOARD, NOV. 8, 1905.

SHOWING CONDITION OF THE YARD WHEN IMPROVEMENTS THEREIN PROPOSED ARE COMPLETED.

Scale, 1" = 100 Ft.





WALLABOUT
CHANNEL.
CLINTON
AVE.
AVENUE
STRINGHAM
OIL STOREHOUSE.
SICARD ST.
213.
214. C.&R. TEMPORARY TIMBER SHED.
PROPOSED ANCHOR RACK
BUNCE AVE.
CEMENT SHED.
PROPOSED PAINT SHOP.
PROPOSED EQUIPMENT RIGGING LOFT.
COAL BIN.
MARINE RAILWAY
PIER F.
PIER E.
PIER D.
DRY DOCK № 3
DRY DOCK № 2.
DRY DOCK No 4.
DRY DOCK No 1.
125
SCRAP BINS
ANCHOR RACK
PAULDING AVE.
PROPOSED C.&R. SHOPS.
AVENUE.
PROPOSED S.E. STOREHOUSE
129 POWER HOUSE.
PROPOSED PATTERN STOREHSE.
SIXTH ST.
30 ERECTING SHOP FOR PATTERNS.
ERECTING SHOP
128.
PROPOSED S.E. COPPERSMITH SHOP
BOILER SHOP 28
207
S.E. MACHINE SHOP.
27 S.E. ADMINISTN BUILDING
29. S.E. FOUNDRY
EXTENSION OF BRASS FOUNDRY
STOREHSE
131. C.&R. SHOPS AND STOREHOUSE
AVENUE
41 Y&D ELECTRIC POWER HOUSE
COAL SHED 209
32 Y&D STABLES
37 PAINT SHOP
FIFTH ST
20 C&R SHOPS
127 C&R BOAT STOREHSE
132 YARDS & DOCKS.
PROPOSED YARDS & DOCKS SHOP.
FOURTH ST
22 EQUIPMENT OFFICE & STOREHOUSE
23 EQUIPMENT STOREHOUSE
24 ORDNANCE OFFICE & STOREHOUSE
AVENUE
AVENUE.
AVE
10 C&R. SHOPS.
11 C&R SMITHERY
114 C&R BENDING SHOP
116 C&R STEEL STOREHOUSE
COAL BIN
BUILDING WAYS
115. C&R. MACHINE SHOP.
MORRIS
6. C&R SHOP
MCDONOUGH
C&R.
117 C&R SHOP.
2 C&R SHOP
12 PATTERN MAKER AND PLUMBERS' SHOP
13 ORDNANCE MACHINE SHOP
THIRD
8 ORDNANCE STHSE
WARRINGTON
CHAUNCEY
9 STOREHOUSE
SECOND
14 EQUIPMENT SHOPS.
AVE.
DECATUR
WIRELESS TELEGRAPH
ADMINISTRATION BUILDING
PARK ST
OFFICERS' QUARTERS.
FLUSHING
126 NAVAL SUPPLY STOREHOUSE
FIRST
121 PAY OFFICE
PERRY
AVE
PARK
MAIN
34
15 TIMBER SHED.
16 TIMBER SHED
ENGINE HOUSE
NAVY
ST
COAL
36 GUARD HOUSE
MARINE GARRISON
YORK ST
PROSPECT ST.
SANDS ST.
HIGH ST.
NASSAU ST.
HUDSON
RETAINING WALL

GENERAL PLAN OF THE UNITED STATES NAVY YARD, NEW YORK, N.Y.

JUNE 30, 1910.

Civil Engineer, U.S.N.

EAST

LEGEND

- BRICK BUILDINGS
- STONE " "
- WOOD " "
- IRON OR STEEL BLDGS
- WORK UNDER CONSTRUCTION
- QUAY WALLS
- FENCE
- CRANE
- YARD RAILROAD
- CRANE TRACK
- INDUSTRIAL RAILROAD
- HOSE REEL HOUSES
- FIRE HYDRANT, SALT WATER, 4 WAY
- " " " " 3 "
- HYDRANT, FRESH WATER, 2 "
- " " " 1 "
- SENTRY BOXES
- WATER PIPES
- SEWERS AND DRAINS
- MANHOLES
- CATCH BASIN
- STEAM PIPE
- CONDUIT WITH WIRE (GENERAL)
- " " " (SPECIAL)
- TELEPHONE YARD
- " LONG DISTANCE
- ARC LIGHT WIRE (D.C.)
- " "
- FIRE ALARM WIRE (CLOSED STRIKING)
- " " PULL BOX
- " " " ON POLE
- " " STRIKING GONG AND INDICATOR
- " " " "
- INCANDESCENT LIGHT
- PNEUMATIC PIPES
- OIL PIPE LINE
- SHIP LIGHTING FEEDERS
- SUBMARINE CABLE
- SHIP WASHERS
- CONNECTIONS TO CITY WATER SUPPLY

RIVER

PIER AND BULKHEAD LINE, APPROVED 1904

PIER NO. 3

PIER NO. 2

Coal Handling Plant

TRUE MERIDIAN

Naval House No. 1

Storehouse No. 30

ORDNANCE SLIP

COB

DOCK

Athletic Field

Inflammable Oils

Crematory

Dump

WHITTEY

BASIN

CRUISEWAY

WALLABOUT

U.S.R.S. HANCOCK

This part of Cob Dock being removed.

Average Elevation 10.0

This part of Cob Dock being removed.

Extreme High Water 9.9 ft.
Mean High Water
Mean Low Water

MARSHALL ST.

JOHN ST.

PLYMOUTH ST.

EVANS ST.

HUDSON AVE.

LITTLE

U.S. NAVY YARD

NAVY YARD

RAILROAD

Coal Pockets

Oil Tanks

Coal Pockets

Oil Tanks

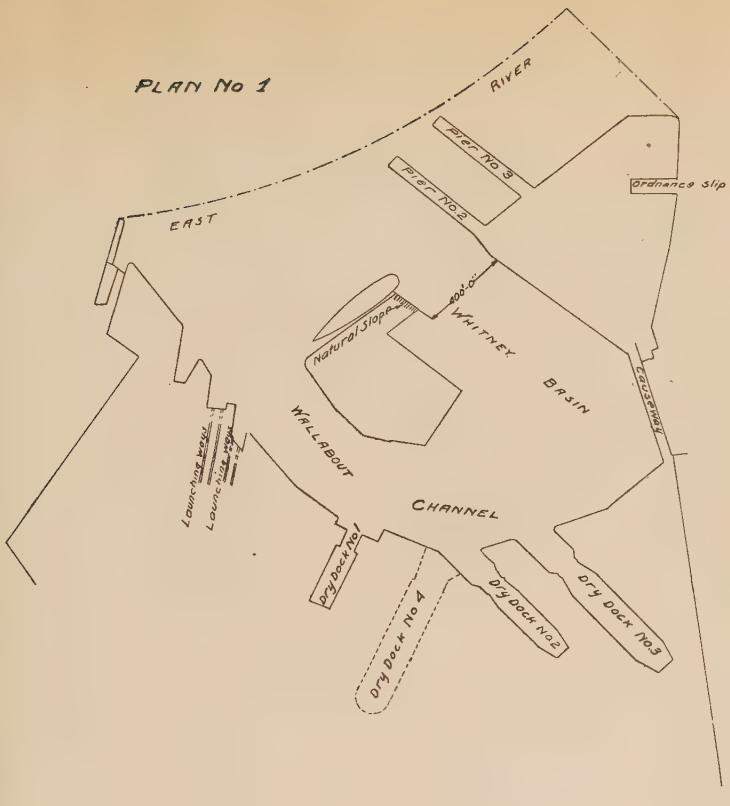
EAST

WALLABOUT

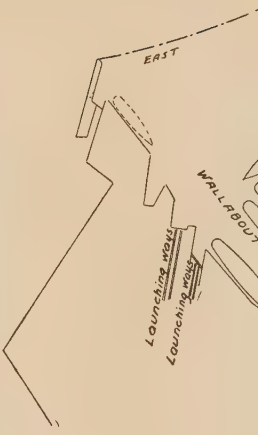
NO 2

CHANNEL
DRY DOCK No. 4.
DRY DOCK No. 1.
DRY DOCK No. 2.
DRY DOCK No. 3.
MARINE BARRACKS
U. S. MARINE BARRACK GROUNDS.
OFFICERS' QUARTERS
FLUSHING AVE.
PRINCETON AVE.
CLINTON AVE.
NAVY STREET
PROSPECT ST.
SANDS ST.
YORK ST.
HIGH ST.
COMMANDANT'S HOUSE
GATE HOUSE
STOCK YARD
BASIN
LEMON
PEACH
PEAR

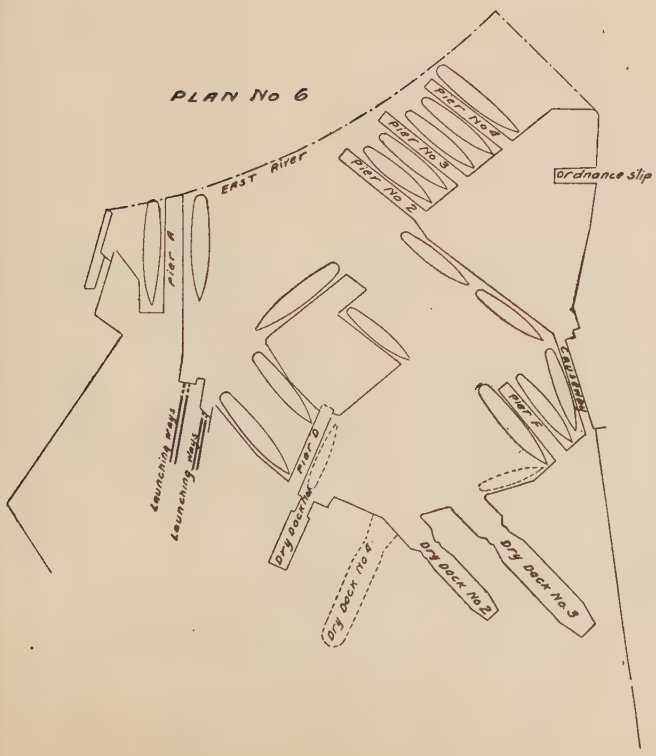
PLAN No 1



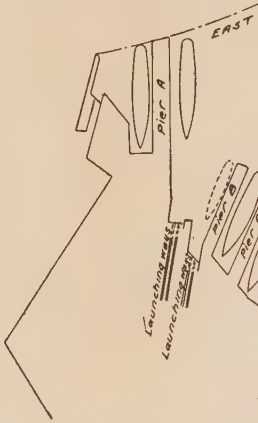
PLAN No 2

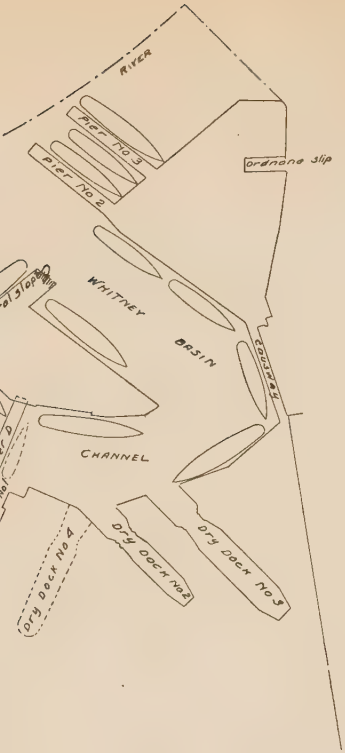


PLAN No 6

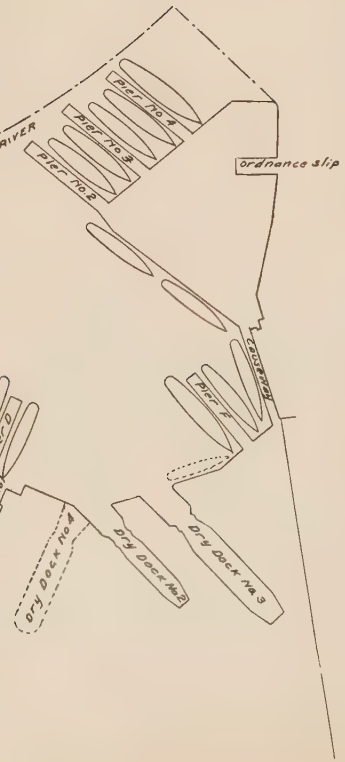


PLAN No 7.



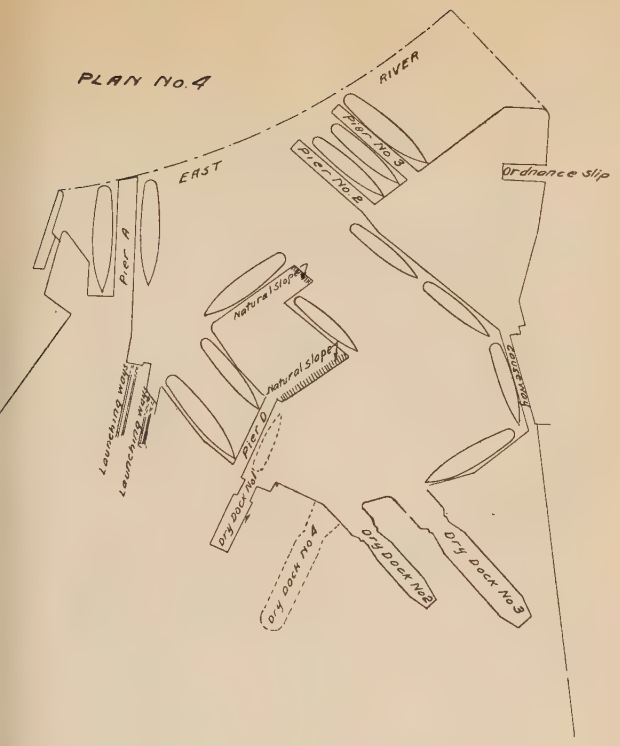


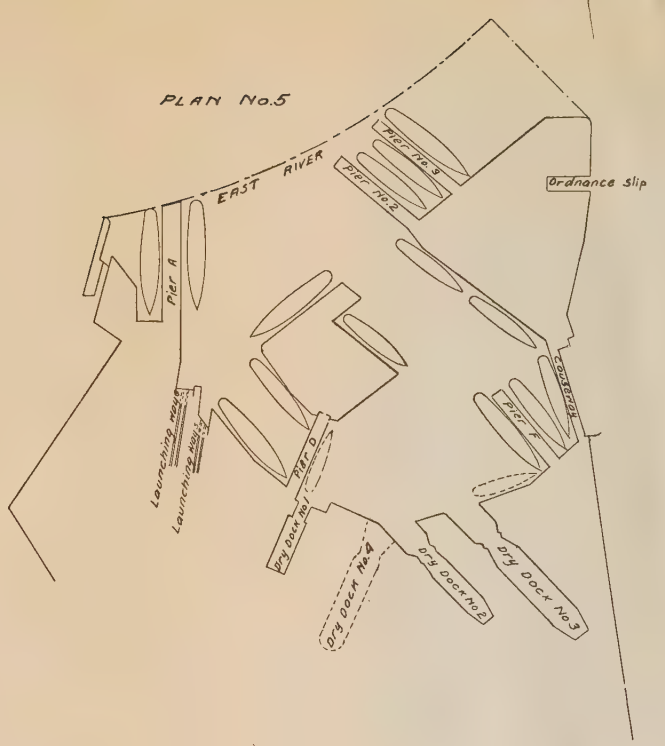
PLAN No. 3

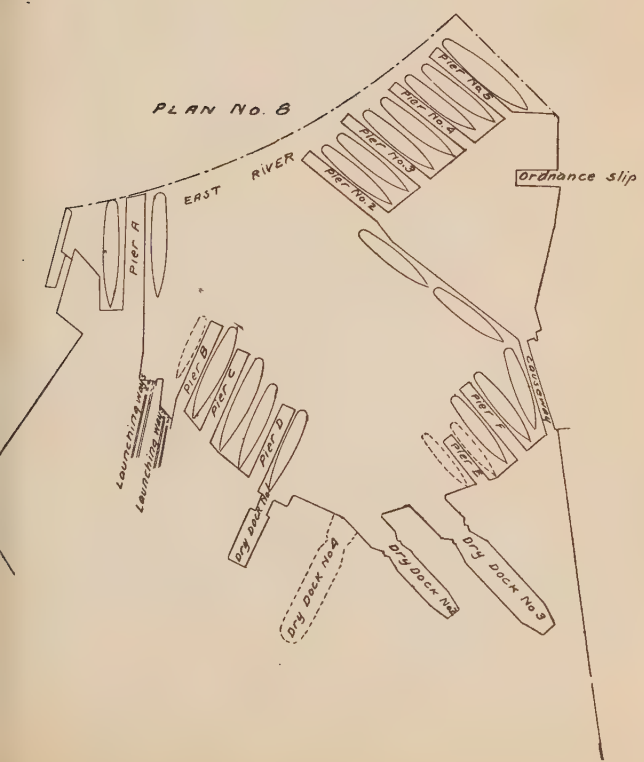


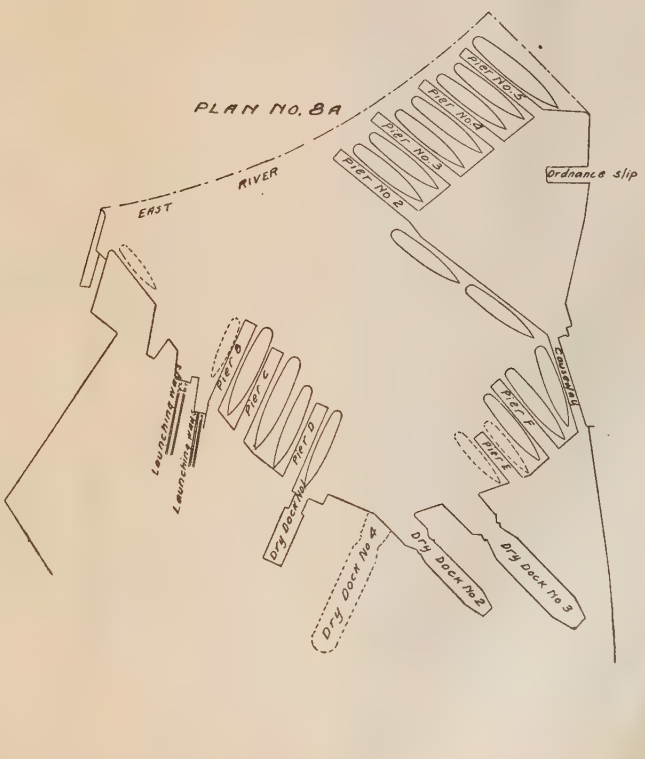
General Plans of the U. S. Navy Yard, New York, N. Y.

Showing Rear-Admiral Murdock's recommendations, as to carrying out, and changes in improvements suggested by the Rodgers Board.


PLAN No.4
EAST
RIVER
Pier No. 3
Pier No. 2
Ordnance Slip
Pier A
Natural Slope
Natural Slope
Launching Ways
Launching Ways
Pier D
Dry Dock No.1
Dry Dock No.4
Dry Dock No.2
Dry Dock No.3
Bulkhead


PLAN No.5
EAST
RIVER
Pier No. 3
Pier No. 2
Ordnance Slip
Pier A
Launching Ways
Launching Ways
Pier D
Dry Dock No.1
Dry Dock No.4
Dry Dock No.2
Dry Dock No.3
Bulkhead
Pier F


PLAN No. 6
EAST
RIVER
Pier No.5
Pier No.4
Pier No.3
Pier No.2
Ordnance Slip
Pier A
Launching Ways
Launching Ways
Pier B
Pier C
Pier D
Dry Dock No.1
Dry Dock No.4
Dry Dock No.2
Dry Dock No.3
Bulkhead
Pier F
Pier E


PLAN No. 8A
EAST
RIVER
Pier No.3
Pier No.3
Pier No.3
Pier No.2
Ordnance Slip
Launching Ways
Launching Ways
Pier B
Pier C
Pier D
Dry Dock No.1
Dry Dock No.4
Dry Dock No.2
Dry Dock No.3
Bulkhead
Pier F
Pier E

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A NEW METHOD OF TEACHING SWIMMING, WITH A FEW HINTS ON RESCUING THE DROWNING.

By Midshipman Fitzhugh Green, U. S. Navy.

I think that my first ambition was to become an expert swimmer. My ideal was the gold-fish that cruised about in his glass-bounded sea. I have not quite realized that dream, but what success I have had I owe to a burly life-guard whose livid skin fascinated my youthful eye as did his great guffaws my ear. From him I extracted a promise that I should learn to swim in one lesson, and I did.

One does not have great height at the age of seven, and when this mountainous friend of mine carried me to water that crested his own freckled shoulders, the sea might just as well have had no bottom. But I trusted implicitly and thereby fulfilled the first requirement of successful teaching, viz., the confidence of the pupil. He held me at arm's length:

"Now sonny, take a big breath and don't wriggle so much as a toe."

With my last lung full of air, as I thought, he put me upright in the water. Down I sank, down, down, until I thought surely I should never stop. I think that I was still dropping when I heard a familiar chuckle and opened my eyes to see that great red face looking as though it were about to burst. At the same instant I realized that the water was just under my eyes and dared not even smile.

When I thought I must have air or strangle he reached under and gave me a touch towards the surface. "Now blow," he roared, and I blew like a punctured balloon, just managing to gasp another breath before I was down as at first. The next time he gave me his hand I was terribly informed that if I wanted any more air I must use my "flippers." I did not wait, but as

soon as he let go commenced to paddle with both hands. To my great amazement, at the first push, up bobbed my shoulders. In another minute I had discovered that my eyes would stay clear of the water without any move on my part; and, if I needed air, I had only to flap my hands to bring my nose and mouth well up. In bobbing up and down I ventured a kick and was somewhat terrified to feel my feet float up on a level with my head. Even in this position I found that I could bring my mouth up clear for a breath. I think that I imitated a side-wheeler, or it may have been a dog. At any rate I never remember a happier moment in my life than when I commenced to crawl with my arms and legs and discovered that I was making headway through the water. I had learned to swim in less than ten minutes!

My wonder at the ease with which I mastered this enchanting game has left every point of that brief lesson stamped indelibly upon my mind. That wonder was not lessened in after years when I saw men becoming swimmers at the rate of a dollar a lesson, nor after that when I saw some of these same swimmers half strangling in a small ground swell. What good to them was the fifty-yard qualification they had passed at the climax of their expensive instruction, if they could not even keep their breath when over the side? It were better to have learned to swim under the water than to drown on the surface!

During our first summer at the Naval Academy we were given the standard distance test. Those who failed were kept to the tank and given daily lessons in the "frog and scissors" kicks and the breast and side strokes. By prolonged paddling about, the boy succeeded in reaching the stage where he could wallow through fifty yards of *smooth water*. From that time he was known as a swimmer and believed himself one.

I am taking an average example when I consider this man on a ship, say at the Southern Drill Grounds where there is a two-knot current and the natural ground-swell cross-cut by a moderate breeze. Just before sundown everyone goes overboard, including our qualified swimmer. He comes up and in opening his mouth, for a breath manages to bite off the crest of a passing wavelet. Successful coughing requires air in the lungs and this involuntary expulsion is followed by a similar inspiration. More water inside is the logical result. Then this man who can swim

the breast and side strokes and cross a fifty-yard tank without effort, makes the sea ladder half-drowned, or is hauled in with a line. He has not been ten feet from the armor shelf! He could swim but could not breathe; the relative importance of the two is not difficult to understand. In ninety-nine cases out of a hundred, where a man has had such an experience, he loses all confidence that he has it in his ability to stay afloat and gives up deep-sea swimming for inshore bathing, where he is sure of his fifty yards and his scientific breast stroke.

I do not wish to insinuate that good swimmers make better officers or better men. But I do believe that through lack of proficiency in that art both officers and men are deprived not only of a great many healthy swims but of the desire for them; that an insignificant number of officers and men could lend assistance to a shipmate in trouble overboard, or stay up themselves for any length of time when a brisk sea was running; and that there are a great many instances where work over the side is improperly done through a man's involuntary realization of the dangerous possibilities if he accidentally slips his bowline. The lives of these men are unduly hazarded every time they risk a plunge, and even an unconscious appreciation of the fact detracts from the quality of their work.

As for the health-giving argument, athletics have gone hand-in-hand with other competition in developing our enlisted personnel. Marathon runners have trained for the greatest strain in athletics by taking three swims a week. Some of our high-speed stoking and the late target practices have been Marathonic in their demands upon nerve and muscle. Excepting this side of the proposition, it bears about the same relation to our daily routine that the Navy, considered as a fighting defense, does to the country's need in times of peace. Both have only perfunctory uses until the moment of need arrives; then their existence becomes vital.

For instance, in 1908 a man was washed overboard from the *New Jersey* in a China Sea typhoon. To launch a life-boat would have been suicidal, and no man on earth could have propelled himself through that awful maelstrom. But this man knew *how to breathe* in a choppy sea and calmly waited for his ship to heave to and throw him a line. He might have been an expert at the crawl and trudgeon, he might have been a distance

swimmer or a sprinter; but had he not known how to fill his lungs between seas his would have been a sad reminiscence.

This prolix digression is pardonable in its illumination of the fact that a human life is valuable for other than sentimental reasons. If, perchance, Ulysses S. Grant had been lost at sea at any time up to his twenty-eighth birthday, the bereaved wife would have received her modicum of condolence befitting the obscurity of her husband's existence. Suppose the accident to occur three years later and you must expand your imagery to include a nation as his stricken family. "A man's a man for a' that," and a seeming failure of a life may become more valuable to the country than the fleet itself. Carelessness of such possibilities is criminal selfishness. The drowning boy should always be saved for his mother's sake, but, if he is an embryo Grant, the mother-country is the one served.

Returning to the subject, I recall the reports sent north while the fleet was exercising in Guantanamo Bay. Scarcely a week passed without several hundred men qualifying as swimmers. My ship arrived late but was no less successful in turning out an amphibious crew. Just before leaving, a swimming meet was held. Little encouragement on the part of the officers resulted in an unexciting series of short races. Strange to say, the winners of events were almost without exception indifferent swimmers. I should approximate that less than 20 per cent of the participants could have made a ship's length in any sort of a sea. Three days later the fleet was ploughing through typical Hatteras boilers and very few life-buoys have ever been dropped at less than two hundred yards from the swimmer.

The officers are to blame. At present our race-boat crews are respected the world over, and they have matured only under the guidance and enthusiasm of those in a position to push their development. Why should the swimming instruction at Guantanamo equip a man only for duck-pond paddling when the resulting over-confidence is even more disastrous than none? Why not have a definite system? Enter it in the drill books along with setting-up exercises and the like. Promote contests and make their prizes worth while.

As an entering wedge, I suggest the following steps in teaching a man to swim:

1. Impress upon him that with the lungs full, or even par-

tially so, the body will float in salt water submerged to about the nose—the natural buoyancy varies with the amount of fatty tissue present. On this breath he can exist from forty-five seconds to two or three minutes, depending upon his lung capacity. Furthermore, the *slightest motion* of arms or legs in a downward direction will bring the mouth clear of the water. This breathing exercise can better be practiced in deep water; it is the fundamental step of the whole. Once the pupil has acquired the knack of filling up with air at the proper times, he has gained a confidence and self-possession that would do credit to an expert.

2. In the beginning all movements should be made slowly. This is in direct contradistinction to the usual fly-wheel movements that one associates with the antics of a beginner. It is fighting the water that drags a drowning man beneath the surface. He paddles as hard downwards as he does up and loses buoyant wind accordingly.

3. Use no particular stroke other than the natural paddling. The famous trudgeon and crawl and polo strokes are only economical adaptations of skill to this.

4. In swimming, always keep body and head parallel to the surface of the water, lifting the face and inhaling only when necessary. If the swimmer attempts to keep his head out of water the body will lie pointing towards the surface and offer considerable more resistance to ahead motion than when lying in the plane of its surface.

5. Observe temperance in duration, distance, speed, and all other circumstances attendant upon the exercise.

Notes on Rescuing the Drowning.

It has been estimated that 44 per cent of accidental drowning is the result of one swimmer improperly assisting another in trouble. When a person becomes panic-stricken in the water he fights in a frenzy of fear. The churning of his arms and legs results in forcing his body below the surface because he naturally makes all up-strokes quicker than those down; that is, his actions are analogous to a man slipping down a steep incline who grips quickly for a new finger hold each time his last one escapes from the tense fingers. The unusual exertions cause quick inhalations and consequent strangling.

The strength of fear cannot be measured by a man's physical appearance, for it depends upon his nervous fabric. Hence a small man will often drag down his more muscular rescuer.

There are several main points that govern in such emergencies:

1. There is always time to divest oneself of coat and shoes. A man will not go down for the last time in less than three minutes, as a rule.

2. Always dive rather than jump into the water. A dive will carry one further in the desired direction and a better position for action is had upon reaching the surface.

3. Approach the man cautiously, talking to him in the hope of quieting his perturbation.

4. Wait until he is reasonable or pretty nearly gone, then make for a hold.

5. Obtain this hold from the rear, making him turn by dashing water into his face; or by employing the old water-polo trick in which the opponent's wrist is grasped with one hand jerking him forward while the body is ducked under and behind him by placing the other hand in his armpit. The proper hold is facing his back with both hands upon his chin and head. If the thumb be pressed firmly upon the nerve just under his ear it will prevent further struggling.

6. His legs must be avoided, as their grip is more powerful than that of the arms. To keep away give him an occasional push in his back with either foot.

7. Keep under water as much as possible, since the buoyancy of one body will help support the other.

I have had several unpleasant experiences of this kind and can vouch for the applicability of these methods.

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ON WEDDLE'S RULE, AND SOME NEW APPROXIMATE FORMULÆ FOR AREAS.

By W. Woolsey Johnson.

1. In a paper, published in these Proceedings, Vol. 35, p. 759, I presented some tests of Simpson's Rules and other cases of Cotes's Rules for approximate areas, together with the rule which was introduced by Thomas Weddle, as a modification of Cotes's Rule for the case of six intervals. I have since found a new basis for Weddle's Rule, and in consequence been led to some new rules of analogous formation.

2. In the preceding paper, to which reference will be frequently made in what follows, it was noticed that Simpson's "First" and "Second" Rules (which are Cotes's Rules for $n=2$ and $n=3$), are both exact for the parabolic curve of the third degree, so that their errors when the curve is of higher degree may be said to be of the same order; and also that the same thing is always true in the case of an even and the next higher odd value of n. Thus Professor Asaph Hall, writing in the *Analyst* in 1876, Vol. 3, p. 5, says: "There is a peculiarity in the approximation by Cotes's method. It is that in passing from an odd number of ordinates [even number of intervals] to an even number, the degree of the error of the quadrature does not change, although its amount is diminished, but when we pass from an even number to an odd number, the error is diminished two degrees."

The diminution of the amount of error referred to above is, however, due solely to the fact that more measured ordinates are used; for, in the case of six intervals, where the same measured ordinates may be used in comparing the rules for two and for three intervals, we find, as was shown by Merrifield (see p. 763), that the amount of error is actually less for the case $n=2$ than for the case $n=3$.

3. Denoting the values assigned by the two rules to the mean ordinate by y'' and y''' respectively, the equations determining them are

$$18y'' = y_1 + 4y_2 + 2y_3 + 4y_4 + 2y_5 + 4y_6 + y_7 \qquad (1)$$

and

$$16y''' = y_1 + 3y_2 + 3y_3 + 2y_4 + 3y_5 + 3y_6 + y_7. \qquad (2)$$

The comparison made by Merrifield was between these values and that of y^{vi}, determined by Cotes's Rule for $n=6$. The ordinates being expressed in terms of their differences, he found the discrepancy to begin, in each case, with the term involving $\Delta^4 y$,[1] and that their amounts (which, of course, constitute the principal parts of the errors) were in the ratio 4 : 9.

4. The comparison, in this and similar cases, can equally well be made by means of the value of y assumed as a power series in x, say

$$y = a_0 + a_1 x + a_2 x^2 + \ \ldots\ + a_n x^n + \ \ldots$$

For this purpose, it is convenient to take the origin at the middle point of the base. Since the limits of the integral $\int y dx$, representing the area, are thus made numerically equal with opposite signs, the odd-numbered coefficients, a_1, a_3, etc., will vanish from the result of integration. They will also vanish from the sums of ordinates equidistant from the origin, of which sums the several rules are made up. Thus the errors contain the coefficients of even powers of x only, these coefficients defining the order or "degree of error" referred to in the quotation above from Professor Hall.

5. The result of comparison, in the present case, is that the errors in y'' and y''', as given by equations (1) and (2), both appear first as a term containing a_4, that they have the same sign, and are in the ratio 4 : 9, as otherwise found by Merrifield.

It follows that the expression $9y'' - 4y'''$ will be without error in a_4; so that, if we put

$$9y'' - 4y''' = 5Y,$$

Y will be a mean value of the ordinate which is free from error in a_4, that is to say, of which the error will be of the order a_6.

[1] This was by mistake printed $\Delta^6 y$ in the previous paper, Vol. 35, p. 763.

Since the relation between Y, y'' and y''' may be written in the form

$$2(18y'') - 16y''' = 20Y,$$

it appears that the coefficients of the ordinates $y_1, \ldots y_7$ in the value of $20Y$ may be found by doubling those in equation (1) and subtracting the corresponding ones in equation (2).

The resulting coefficients are

$$1, 5, 1, 6, 1, 5, 1,$$

which are, in fact, the multipliers used in Weddle's Rule.

Weddle's Rule may thus be based absolutely upon Cotes's Rules for $n=2$ and $n=3$,[2] instead of being regarded as an approximation to Cotes's Rule for $n=6$.

6. The next case in which a similar, so to speak, *composite* rule can be derived from two Cotesian Rules by the elimination of errors of the same order results from the rules for $n=4$ and $n=5$, in both of which the first term of the error involves a_6.

Suppose then that the measured ordinates divide the base into 20 equal intervals, so that we may make five applications of the Cotesian Rule for $n=4$, or four applications of that for $n=5$. In determining the mean ordinate the common interval may be assumed as the unit. Then the mean ordinate determined by integration is

$$\bar{y} = a_0 + \tfrac{1}{3} \cdot 10^2 a_2 + \tfrac{1}{5} \cdot 10^4 a_4 + \tfrac{1}{7} \cdot 10^6 a_6 + \ldots$$

According to the Cotesian Rules (see p. 760), the multipliers in the two cases (carried so far as the middle ordinates) are:

For y^{iv}: 7, 32, 12, 32, 14, 32, 12, 32, 14, 32, $|12|$, etc.
For y^{v} : 19, 75, 50, 50, 75, 38, 75, 50, 50, 75, $|38|$, etc.

The aggregates, when the values of the ordinates are introduced, are the values of $450y^{iv}$ and $1152y^{v}$ respectively. On comparison with $\bar{y}$, the first terms of the errors of y^{iv} and y^{v} are found to be $\frac{32a_6}{21}$ and $\frac{275a_6}{84}$. These errors are in the ratio 128 : 275 (the advantage being, as in the case of y'' and y''', in favor of the even numbered rule).

[2] The relation between the three sets of multipliers in these rules was first pointed out to me by Professor W. S. Harshman.

It follows that the errors of $450y^{iv}$ and $1152y^{v}$ are in the ratio 2 : 11. Hence, if we put

$$11(450y^{iv}) - 2(1152y^{v}) = 2646Y_{4\,5},$$

$Y_{4\,5}$ will be a mean value of y free from error in a_6; that is to say, one of which the error is of the order a_8. This equation shows that the multipliers for this new mean value are found by taking 11 times those for y^{iv} and subtracting the doubles of those for y^{v}. Hence the multipliers for $Y_{4\,5}$ are found to be

$$39, 202, 32, 252, 4, 276, -18, 252, 54, 202, |56|, \text{ etc.}$$

7. It is readily verified by direct substitution that the terms in a_6 vanishes from the error when these multipliers are used. I have derived the Cotesian numbers for $n=20$, and it is noteworthy that (unlike the case of Weddle's Rule) the ratios of the numbers obtained above bear no resemblance to the corresponding ratios in the complete rule.[3]

8. The multipliers in the rule for $Y_{4\,5}$ given above are, like those in the higher Cotesian Rules, inconveniently large for practical purposes. I have, however, succeeded in finding, by a similar process, a practicable rule for the case of twelve intervals.

As stated above, the error in Weddle's mean ordinate (which may be denoted by $Y_{2\,3}$) is of the order a_6; but this is also the error of y^{iv}, the result of Cotes's Rule for $n=4$. These rules admit of direct comparison when twelve intervals are used; hence, when this is done, their errors of order a_6 may be eliminated, and a composite rule found for a new mean value which may be designated by $Y_{2\,3\,4}$.

9. For twelve intervals the mean ordinate determined by integration is

$$\bar{y} = a_0 + \tfrac{1}{3}\cdot 6^2 a_2 + \tfrac{1}{5}\cdot 6^4 a_4 + \tfrac{1}{7}\cdot 6^6 a_6 + \ \ldots$$

The multipliers in the two cases now to be compared are:

For $Y_{2\,3}$: 1, 5, 1, 6, 1, 5, |2|, 5, 1, 6, 1, 5, 1.

For y^{iv}: 7, 32, 12, 32, 14, 32, |12|, 32, 14, 32, 12, 32, 7.

[3] On making a test similar to the *"Third Test"* of the previous paper (p. 766), the true value being $\log_e 2$, I found for the error of y^{iv}, 370; of y^{v}, 706; and of $Y_{4\,5}$, 17, all in the 11th decimal place. The error of the Cotes Rule, or y^{xx}, which is of the order a_{22}, was found to be —43 in the 17th decimal place. Of course, the superior accuracy shown in these tests as compared with those previously given for y'' y''' and $Y_{2\,3}$, is partly due to the greater number of measured ordinates used.

The first of these lines represents an aggregate of ordinates equal to $40Y_{2\,3}$, and the second, an aggregate equal to $270y^{iv}$. On substituting the values of the ordinates, the first of these aggregates will be found to exceed $40\bar{y}$ by $\frac{2400a_6}{7}$, and the second to exceed $270\bar{y}$ by $\frac{28800a_6}{7}$. These errors are in the ratio 1 : 12.[4] Hence if we put

$$12(40Y_{2\,3}) - 270y^{iv} = 210Y,$$

we shall have the new mean value of which the error is of the order a_8. The multipliers for this value are therefore found by subtracting the numbers in the second line above from twelve times the corresponding numbers in the first line. The resulting multipliers are

$$5, 28, 0, 40, -2, 28, |12|, 28, -2, 40, 0, 28, 5.$$[5]

10. A number of circumstances conspire to render this rule for $210Y$ capable of simple expression and application. For this purpose it will be convenient to denote the measured ordinates by $y_0, y_1, \ldots y_{12}$; and then, removing y_0, to replace y_{12} by the arithmetical mean $\frac{1}{2}(y_0 + y_{12})$. We then have 10 for the multiplier of y_{12}, and the rule contains but five distinct multipliers, namely, 28, 40, -2, 12, and 10. Furthermore, since $40 = 28 + 12$, and $10 = 12 - 2$, they may be reduced to the three numbers 28, 12, and -2, each of which will thus be the coefficient of a certain sum of ordinates. The first of these sums consists of all the odd-numbered ordinates: the second, of those whose indices are multiples of 3; and the third, of those whose indices are divisible by 4. Denoting these sums by A, C, and D respectively, we have

$$210Y = 28A + 12C - 2D,$$

where $A = \Sigma y_{2r-1}$, $C = \Sigma y_{3r}$, and $D = \Sigma y_{4r}$.

[4] The errors in the values of $Y_{2\,3}$ and y^{iv} are therefore in the ratio 9 : 16; so that Weddle's Rule is more accurate than Cotes's Rule for $n = 4$. When tested, as in the preceding note, by the computation of $\log_e 2$, the errors were found to be:— for Weddle's Rule 427, and for y^{iv}, 729 in the 10th decimal place.

[5] I have compared the error in a_8 of this rule with the like error of a double application of Cotes's Rule for $n = 6$, and find the errors to be in the ratio 4 : 9, in favor of the new rule. Accordingly, the errors in the test with $\log 2$ were 40 and 83 respectively in the tenth decimal place. A rule derived by the elimination of the error in a_8 further reduced the error to 4 in the tenth place.

Finally, putting this equation in the most convenient form for calculation, we have

$$Y=\tfrac{1}{5}\left\{\tfrac{2}{3}A+\frac{2C-\frac{1}{3}D}{7}\right\}$$

for the mean ordinate, and for the area the product Yb where b is the base.

11. When the number of intervals is a multiple of 12 a repetition of the rule gives 10 as the multiplier of y_{12}, y_{24}, etc., and it will only be necessary to put the arithmetical mean of the extreme ordinates in place of the final one, in forming the sums C and D. The formula will then give the sum of the mean ordinates in the several divisions and we shall still have

$$\text{Area}=\frac{b}{5}\left\{\tfrac{2}{3}A+\frac{2C-\frac{1}{3}D}{7}\right\},$$

where b is the base of one division of the area, or twelve times the common interval between the ordinates.

Putting h for this common interval we may finally write

$$\text{Area}=\frac{4h}{5}\left\{2A+\frac{6C-D}{7}\right\}.$$

It may be noticed that, using the same device with regard to the extreme ordinates, and putting $B=\Sigma y_{2r}$, the sum of the even numbered ordinates, Weddle's Rule becomes

$$\text{Area}=\frac{3h}{10}(5A+B+C).$$

The present rule involves but little more labor, and should exceed Weddle's Rule in accuracy as much as the latter exceeds Simpson's first rule.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FUNDAMENTALS OF NAVAL TACTICS.

By Lieutenant Romeo Bernotti, Italian Navy.

Translation by Lieutenant H. P. McIntosh, U. S. Navy, Retired.

INTRODUCTION.

The study of naval tactics has for its object the employment of ships in battle. This does not mean that the field of such inquiry is limited simply to that in which the weapons are in action (offensive contact); indeed it is well understood that, directly in relation to the battle, the movements of the two adversaries from the time of their sighting each other are to be considered; furthermore, on the information obtained from the units that keep the enemy in sight, the remainder of the forces can be arranged in the most opportune way for its tactical employment. Therefore, under the head of *tactical contact,* besides the above-mentioned form (offensive contact), it is well to include also that of *contact out of range.*

To proceed from the simple to the complex, let us examine successively:

I. *The elements of maneuvering;* seeking to establish the importance of the various elements (angles and distances) by means of the examination of the *momentary tactical situations;* considering the mobility of the adversaries only in so far as it affects the probability of hitting with the weapons.

II. *Maneuvering;* examining how, by its effect, the tactical situation may be subjected to change.

III. *Tactical action as a whole,* on the basis of the above-mentioned parts, completing the picture of the battle which results from them.

One may find a certain reluctance in admitting the convenience of studying the momentary situation apart from the maneuvering, but it is necessary to consider that if the study of the movement is put first, it would appear to be necessary to leave the other out.

PART I.

THE ELEMENTS OF MANEUVERING.

CHAPTER I.

DIRECTIONS OF MAXIMUM UTILIZATION.

1. *Definitions.*—We call *long-range combat* that which is developed within the limits of distance which permit the use of guns only.

By the *polar bearing* of a point is meant the angle that the line joining the center of the ship with that point makes with one of the principal directions of the ship (direction of the bow, or of the stern, or of the beam).

The polar bearing of a ship that is being fired upon is also called the *inclination to the plane of fire.*

2. *Sectors of Maximum Offense.*—Let us examine the manner in which the offensive power of a ship varies with the variation of the inclination to the plane of fire.

First of all, let us suppose that the ship under consideration is armed with guns of a single caliber.

By taking into account the fields of fire, the number of the guns that fire in the different directions is determined. The variations of the offensive power may usefully be represented by means of a polar diagram, whereon the principal directions of the ship are traced, and whereon, for every inclination, the radius vector has a length proportional to the number of guns that can fire in that direction.

The offensive field may not be uniform.

The first monitor had two dismountable smoke-stacks; and so the armament, enclosed in a single revolving turret, had a field of fire of 360°.

A type of ship that could satisfy such requirements would secure to the single guns the maximum utilization; but if we establish it as an axiom to consider every ship as an organic unit unit of the fleet, and then seek to obtain the maximum return from the whole organization, we must admit the necessity of having the

same kind of guns on every ship. This being the case, in order that the offensive field might be uniform, it would be necessary, ideally, to have a number of guns on a circumference, each gun with a field of fire of 180°. The number of the guns being practically limited, there follows the possibility of having some of the guns with a greater field of fire than the one just mentioned, which involves the necessity of the offensive field having its maximums and its minimums.

When long-range combat was held to be only a transitory phase of the action, it was drawn therefrom as a corollary that the maneuvering should be independent of the employment of the guns; therefore it was sought to approximate to a circular arrangement, securing the development of the maximum offensive power in the principal directions of the ship. Thus there was designed for the heavy guns an arrangement on a diagonal (Duilio), and in a lozenge, adopted by the French. Thus, also, disposing a battery of medium guns about the sides of a lozenge, given the fact that each gun may fire very close to another situated further inboard, we may say that the above-mentioned object is attained. With arrangements of this nature, if, starting from the beam of the ship, we consider the offensive power developed in the various directions, we find that the maximum power is developed up to a certain angle from the beam; beyond this limit, the power falls to a minimum, it becoming possible to fire only with the guns in one quadrant, until, in the direction of the keel—since there the guns of the other side enter also into action—we have again the maximum offensive potentiality. Thus we have, laterally, sectors of maximum offense and sectors of minimum offense; in the direction of the keel we have a *direction* of maximum offense, but not a *sector.*

At present the power of the artillery compels us to consider the long-range combat as a most important form of action, in which it is necessary to subordinate the maneuvering to the good employment of the guns, without, however, creating too difficult conditions for the maneuvering. From this principle we immediately derive the consequence that simple *directions* of maximum offense badly satisfy the tactical necessities. It is then necessary to direct the mind not so much to the importance of uniformity in the offensive field, as to securing for this field the maximum intensity where most convenient. On this basis it must be re-

membered that, in every discussion of the distribution of the offensive power, the amplitude of the fields of fire of the single guns must serve as basic data only; the important thing is the manner in which the various fields of fire blend together.

Since ships are longer than they are broad, the maximum number of guns can be placed along its length; in such case the result of the distribution of the offensive power still remains, as already mentioned; or, from sectors of maximum offense we pass to those of minimum offense, with a new increase of power when we reach the line of the keel; however, the power in the latter direction is inferior to the maximum. The nearer we approach the arrangement of all the guns on the longitudinal axis, the more we increase the said inferiority, and at the same time we increase the amplitude of the sectors of maximum offense; and, reciprocally, the greater the similarity between the power in line with the keel and that of the sectors of maximum offense, the smaller is the amplitude of the said sectors.

When the armament is composed of guns of different calibers, in order to establish the elements of the distribution of the offensive power that are important in long-range combat, it is evidently necessary to proceed in the following manner: (1) Exclude the guns that are inefficacious in the said form of action; thus, for instance, in battle between armored ships, only the guns above a caliber of about 15 centimeters are to be considered. (2) Determine the sectors of maximum and minimum offense for the calibers that are useful in long-range battle in the manner above mentioned. (3) Observe how the sectors of the various calibers intermingle.

Rigorously, we should hold to be sectors of maximum offense of the ship all those common to the sectors of maximum offense of the various calibers. Their amplitude would hence be determined by the caliber having the most limited sectors; however, it is easy to understand how the amplitude in question may be considered as increased when we take into account the relative importance of the different parts of the armament. In long-range battle the maximum caliber has predominating importance; hence it is its distribution that should essentially be considered. Ordinarily, in the interval between the extremes of the sectors of maximum offense of the maximum caliber, and those of the sectors in which we have, absolutely speaking, the maximum of

power, the variation may be held to be negligible. More in general, by considering the importance that each kind of gun has in the composition of the armament, it will be easy to establish what caliber shall determine the amplitude of the sectors of maximum offense which it will be well to take as the standard in tactical employment.

The search for the best disposition of the guns forms no part of the study of tactics, although it is of consequence to it; for this reason we confine ourselves to simple statements concerning the manner in which the offensive field is distributed in the existing types of ships.

Generally the offensive field is symmetrical with respect to the longitudinal axis * and to the transverse axis.

Dissymmetry with respect to the beam would be advisable whenever we might, with reason, establish a greater probability of fighting with the enemy bearing forward of the beam than abaft the beam, or vice versa; for the present we confine ourselves to noting that we may not exclude the convenience of keeping the enemy abaft the beam, when this is not done in order to avoid action.

In general, between two scouting vessels, one will be interested in bringing about an action, and the other in avoiding it; the tactical maneuvers will thus assume the form of a pursuit. It is not simply a question, as above indicated, of keeping the enemy forward of or abaft the beam, with the object of causing the tactical action to assume the form that we desire, but, more properly, it is a question of chasing or being chased; hence the power of the fire in the direction of the keel will have greater importance than in the types of ships not destined for detached service; this explains why, in the light ships, we seek to obtain directions of maximum offense in line with the keel.

* A dissymmetry with respect to the longitudinal axis would obtain, for example, with two turrets arranged, one on the starboard side and the other on the port side, very near to each other, with their centers in a direction inclined to the said axis, when the guns of one turret are higher than those of the other, so as to permit firing over them; dispositions of this nature would oblige us to present to the enemy a definite side. The study of tactical maneuvering will show us how harmful this limitation may be. (Author's note.)

The types of armored vessels that at present compose the fleet can, on the basis of their armaments, be grouped in the following categories:

(1) *Antiquated ships*, in which the sectors of maximum offense extend about 30° forward of, and about the same distance abaft, the beam.

(2) *Modern ships* (not specially constructed for longe-range battle). In these ships the distribution of the fire is about as follows: (a) Maximum intensity in a restricted sector in the vicinity of the beam. (b) Intensity a little inferior to the maximum, and practically to be considered as maximum, in the sectors of 45°-50° forward of and abaft the beam. (c) Minimum intensity in the sectors between the direction of the keel and 45° from the beam. (d) Strong intensity in line with the keel.

(3) *The most modern ships*, that, by the disposition of their armaments, may be divided into two categories: (a) Those with turrets on the longitudinal axis and on the sides, or with a part of them on the axis and a part of them removed therefrom; the sectors of maximum offense, with an amplitude of about 45° forward of, and 45° abaft, the beam, as in the modern ships. (b) With all the turrets on the longitudinal axis; the sectors of maximum offense extend to 55° or 60° forward and abaft, and, as a maximum limit, to 70°.

In the discussion of tactical employment it is therefore necessary to take as a basis the following data: The amplitude of the sectors of maximum offense, in the generality of present-day vessels, is from 45° to 50° forward of and abaft the beam. In some ships this amplitude is 30°, and in others it is 60° forward of and abaft the beam.

3. *Inclination and the Probability of Being Hit.*—Within the limits thus determined for the sectors of maximum offense, we propose to estimate the influence that the inclination of the ship to the plane of fire (which we will count from the beam) has upon the percentage of effective hits made by the enemy.

We may hold, approximately, that the target presented by our ship has a certain uniform height q above the sea, and that its horizontal section is an ellipse, with its axes respectively equal to the length L, and to the maximum breadth l of the ship itself.

Let $PTP'T'$ (Fig. 1) be the section corresponding to the waterline; PP' and TT' being respectively the longitudinal axis and

the transverse axis. If $TON = \psi$ is the inclination to the plane of fire, by projecting on the sea the contour of the upper section of the target, in the direction of the trajectories of all the shots that would touch that upper section, we delineate on the surface of the sea another ellipse which may be held to be identical with the first. The corresponding points of the two ellipses are distant

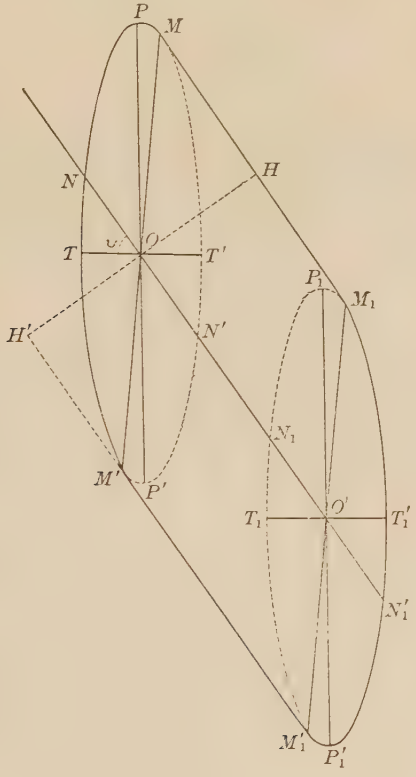

FIG. 1.

from each other $\frac{q}{\tan \omega}$, ω being the angle of fall of the projectiles. If MM_1 and $M'M'_1$ are the traces of the planes tangent to the target, drawn parallel to NO, the thin, fictitious, horizontal target, to which we may refer for the question we are discussing, is limited by the portion MNM' of the water-line, by the two segments MM_1 and $M'M'_1$, and by the remaining portion of the ellipse $M_1N'_1M'_1$.

Indicating by $A\psi$ the depth NN'_1 of the fictitious target in the direction of the plane of fire, by the known properties of the ellipse * we have

$$A\psi = NN' + \frac{q}{\tan\omega} = \frac{Ll}{\lambda} + \frac{q}{\tan\omega},$$

making

$$\lambda = \sqrt{l^2 \sin^2\psi + L^2 \cos^2\psi}.$$

The surface $S\psi$ of the fictitious target is given by

$$S\psi = \frac{\pi}{4} Ll + \frac{q}{\tan\omega}\lambda.$$

In regard to the probabilities of hitting, the above-mentioned fictitious target may be replaced approximately by a rectangle with a depth $A\psi$ and a breadth $B\psi$, $B\psi$ being equal to $\frac{S\psi}{A\psi}$.

The probability $p\psi$ of hitting is given by

$$p\psi = p\left(\frac{A\psi}{Ex}\right) p\left(\frac{B\psi}{Ez}\right),$$

Ex and Ez being respectively the longitudinal and lateral stretches in which are included 50 per cent of the shots, and p being taken from the table of the factors of probabilities,† entering the table with the factors $\frac{A\psi}{Ex}$ and $\frac{B\psi}{Ez}$.

* In the equation of the ellipse which has for its axes L and l, substituting for x and y the projections of ON respectively on OP and OT, we deduce

$$NN' = \frac{Ll}{\lambda}. \qquad (a)$$

The surface $S\psi$ of the thin fictitious target is given by the area of the aforesaid ellipse, and by that of the parallelogram $MM'M_1M_1'$, which is $\frac{q}{\tan\omega} HH'$; HH' being the projection of MM' normally to the plane of fire. The value of HH' is determined as follows:

The area of the parallelogram, which has for its medians two conjugate diameters, is constant and equal to Ll; on the other hand, the area of the parallelogram, which has for medians NN' and MM', is given by $\overline{NN', HH'}$; hence $\overline{NN', HH'} = Ll$; and by equation (a) we find $HH' = \lambda$. (Author's note.)

† With what has been said in this and in the following chapter relative to the probabilities of hitting, it is well to record the following definitions:

The mean of the absolute values of the misses or deviations in a certain direction is called the *mean miss or deviation* in that direction.

The mean deviation, multiplied by the coefficient 1.69, gives the corresponding dimension of the *stretch that includes 50 per cent of the shots.*

If p_0, A_0 and B_0 are respectively the values of $p\psi$, $A\psi$ and $B\psi$ for $\psi = 0$ (that is, with the ship placed normally to the plane of fire), making

$$K\psi = \frac{p\psi}{p_0}, \quad K'\psi = \frac{p\left(\frac{A\psi}{Ex}\right)}{p\left(\frac{A_0}{Ex}\right)}, \quad K''\psi = \frac{p\left(\frac{B\psi}{Ez}\right)}{p\left(\frac{B_0}{Ez}\right)},$$

we obtain

$$K\psi = K'\psi K''\psi.$$

For a battle we may not attribute to the 50 per cent stretches the values that are taken from the range tables, but we may establish rational limits that include the values of p. This being the case we note that by entering the table of factors of probabilities with a value $p\left(\frac{A_0}{Ex}\right)$, we may obtain therefrom $\frac{A_0}{Ex}$, which, multiplied by $\frac{A\psi}{A_0}$, gives us $\frac{A\psi}{Ex}$; with this argument, we obtain from the table above mentioned, $p\left(\frac{A\psi}{Ex}\right)$, which, divided by $p\left(\frac{A_0}{Ex}\right)$, gives us a value of $K'\psi$. We obtain $K''\psi$ by an analogous operation.

The values of $\frac{A\psi}{A_0}$ and $\frac{B\psi}{B_0}$ are functions of ω. Rigorously, for applying the indicated process, we ought to know the distances corresponding to the considered values of $p\left(\frac{A_0}{Ex}\right)$ and $p\left(\frac{B_0}{Ez}\right)$; however, this is not necessary because, within the limits between which ω may oscillate, for the various kinds of guns, in long-range battle, we find practically that the variations of $\frac{A\psi}{A_0}$ and $\frac{B\psi}{B_0}$ are restricted in such fashion that we may assume for

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The mean deviation multiplied by the coefficient 1.69 : 2 = 0.845, gives the corresponding probable mean error, which is greater than one-half of the errors and less than the other half.

The mean probable error produced by the simultaneous action of sundry independent causes is given by the square root of the sum of the squares of the mean probable errors. (Author's note.)

these quantities a mean value for every value of ψ within the limits of 0° and 70°.

Such being the case, for a ship that has the dimensions

$$L=150 \text{ meters}, \quad l=25 \text{ meters}, \quad q=8 \text{ meters},$$

supposing that the probability of direct hits in long-range battle may vary between 10 per cent and 50 per cent, we obtain for these limits the following

VALUES OF $K'\psi$.

Probabilities.

ψ	10 per cent.	50 per cent.	Mean.
0°	1	1	1
30°	1	1	1
45°	1.10	1.10	1.1
60°	1.25	1.18	1.2
70°	1.60	1.46	1.5

As is seen, the values of $K'\psi$ corresponding to the two limits of probability are about equal; we may therefore consider their mean.

For the supposed dimensions of the ship, the above values of $K'\psi$ express also the values of $K\psi$, within the limits of distance in which the width of the target is so much superior to that of Ez as to enable us to hold $K''\psi=1$.

When $B_0=4Ez$ (that is to say, when there is a probability of 1 with respect to the ship that presents her beam) we obtain the values of $K''\psi$ indicated in the following table; and hence, multiplying the values of $K''\psi$ by the corresponding values of $K'\psi$, we have the values of $K\psi$.

ψ	$K''\psi$	$K\psi$
0°	1	1
30°	1	1
45°	0.9	1
60°	0.8	1
70°	0.6	0.9

At the greatest distances an important lateral dispersion is inevitable. Under the not exaggerated hypothesis that out of 100 shots we may have 80 good in direction, we obtain

ψ	$K''\psi$	$K\psi$
0°	1	1
30°	0.9	0.9
45°	0.8	0.9
60°	0.6	0.7
70°	0.4	0.6

Hence we draw the following deductions:

(1) Within the limits of distance in which there is certainty that all the shots will be good in direction, the probability that the ship will be hit increases almost insensibly with ψ varying from 0° to 45°, and afterwards it increases rapidly.

(2) Within the limits of distance in which the above-mentioned certainty is had only when the ship presents her beam, the directions included in the sectors of maximum offense are unimportant in so far as the probability of the ship being hit is concerned.

(3) At the greatest distances, the directions that are not removed more than 45° from the beam may still be considered unimportant with respect to the probability of the ship being hit; this probability undergoes a notable diminution at the extreme limits of the sectors of maximum offense of ships with all the heavy guns located on the longitudinal axis.

It is moreover to be noted that, in the hypothesis that for $\omega=10°$, we have $p\left(\frac{A_0}{Ex}\right)=10$ per cent, $p\left(\frac{B_0}{Ez}\right)=80$ per cent, for $\psi=90°$, or when the ship presents herself end on, we have $K'\psi=2.6$, $K''\psi=0.2$; and hence, $K\psi=0.5$; which, compared with the other values of $K\psi$ already calculated, shows that, *at the maximum fighting distances, a ship that presents herself end on, diminishes in that way the percentage of the enemy's effective hits.*

The preceding deductions avail for the hypotheses that may be made concerning the dimensions of battleships.

4. *Inclination and Protection.*—When it is said that a certain gun is capable of perforating a given thickness of vertical armor at a given distance, it is with reference to the hypothesis that the projectile arrives in a horizontal direction, normally to the plate, and that the latter is exactly vertical. As is well known, in battle, in the most favorable case for the gun, that is, when the plane of fire is normal to the plate, the conditions differ from those above stated for the following principal reasons: (1) The divergence of the axis of the projectile (supposed to be coincident with the direction of movement) from the normal to the plate, owing to the angle of fall and to the oscillatory movement of the target. (2) The divergence of the axis of the projectile from the direction of its movement. (3) The elasticity of the entire hull, which forms one body with the armor. We deduce from this that, in battle, a plate normal to the plane of fire is capable of resisting a

projectile that, with the same velocity of impact, would perforate it under the conditions of trial at the proving grounds. With reference to the battle, the hypothesis that the projectile arrives horizontally, with its axis coincident with the direction of movement, may then be taken into consideration; observing, however, that the results that are deduced therefrom have reference to limit conditions of efficacy of the projectile, that is to say, to ideal conditions, not attainable.

This being understood, if, under the proving ground conditions, and with the plane of fire normal to the plate, a projectile animated by a velocity of impact v is capable of perforating a thickness of armor s, on the other hand, when the plane of fire is inclined to the normal by an angle, ψ, the perforable thickness is s_i, less than s; and this does not depend solely upon the fact that there is disposed normally to the plate only a component of the velocity, but also upon the greater distance that the projectile must travel in the plate itself. This being the case, we may hold that the conditions of oblique impact are equivalent to those of normal impact with a velocity of impact $v \cos h\psi$, where h is an opportune coefficient.

Applying the De Märre formula for perforation successively to the case of normal impact and to that of oblique impact, and indicating by F the product of the terms of said formula, independently of the thickness of the plate and of the velocity of impact, we have

$$v = Fs^{0.7},$$
$$v = \cos h\psi = Fs_i^{0.7};$$

and hence

$$s_i = s(\cos h\psi)^{\frac{1}{0.7}}.$$

In order to establish the value of h, let us note first of all that, concerning oblique fire, the data are scant and the formulas are uncertain. It appears to be proved that the cap of the projectile may have among its advantages that of approaching the axis of the projectile to the normal to the plate; and hence, for moderate values of ψ, it seems that we may hold $h = 1$. With the increase of ψ (that is to say, when the obliquity of fire is greater), the efficacy of the cap diminishes, and the perforable thickness s_i is less than that obtained by making $h = 1$. Consequently *it is logical to admit that h may be a function of* ψ. For $\psi = 60°$ the rebounding of the projectile is realized (when the thickness of

the plate is not excessively small with respect to their caliber), and hence $v\cos(h\,60°)=0$; from which $h=1.5$.

Admitting that h varies proportionally from the value of $h=1$, which corresponds to $\psi=0$, to the value $h=1.5$, corresponding to $\psi=60°$, we obtain with the formula above mentioned the following table:

ψ	$\frac{s_i}{s}$
10°	0.98
20°	0.88
30°	0.72
40°	0.49
45°	0.35

If the values of s refer to limit conditions of efficacy of the projectile, the same may be said for the corresponding values of s_i; in other terms, as the thickness s—which, with a certain velocity of impact, is perforable on the proving ground—is more than sufficient to prevent penetration during battle, analogously, for an obliquity ψ the same result is obtained with a thickness s_i whose ratio with s is about that indicated in the table.

This shows the desirability of presenting the armor obliquely to the fire. Bearing in mind the perforating capacity of modern heavy guns, on the basis of the results above set forth—although we are far from pretending that they are rigorously exact—we may affirm that, for a ship which has on its sides armor of a thickness of 150 millimeters or greater, there are directions included in the sectors of maximum offense from which the armor cannot be pierced.

Let us suppose the case that we have on the sides a uniform thickness of armor not less than 150 millimeters. *The direction nearest the beam in which the side is invulnerable to the enemy's most powerful gun,* while it permits the development of the maximum offensive power, is that to which, with regard to the armor, the maximum defensive capacity corresponds; indeed, in the directions nearer to the beam the perforation of the side is possible. By approaching further toward the longitudinal axis the effects of the enemy's fire increase—it becomes an enfilading fire.

In the case of different thicknesses of armor, *the defensive capacity is maximum when the enemy bears in the direction nearest the beam in which the vulnerability of the side is minimum;* and this direction is determined with reference to the minimum thick-

ness of armor that covers a considerable surface on the side; when, however, such thickness is not below a certain limit, which may be held to be about 150 millimeters. As to armor of less thickness, it should be held to be a useless burden, since it could not possibly prevent perforation.

In order to fix these ideas we may distinguish two cases:

(1) If the ship under consideration carries at the water-line a belt which has, over a considerable stretch, a thickness greater than 150 millimeters, and above has only thin armor, or if also above the belt the thickness of the armor is greater than 150 millimeters, the maximum defensive capacity may be held to be obtained in the directions inclined about 30° to that of the beam.

(2) If the ship has on its sides large extensions of armor with a thickness of about 150 millimeters, the maximum defensive capacity is obtained in the directions about 45° from the beam.

5. *Directions of Maximum Utilization.*—When a ship is opposed to another in long-range battle, it is said to have the other bearing in a *direction of maximum utilization* if it is inclined, with respect to the line joining it with the adversary, in such fashion as to enable it to use the maximum offensive power, while at the same time presenting itself also under the best defensive conditions.

What we have set forth demonstrates the existence of such directions, and precisely permits us to conclude:

(1) At the maximum fighting distances (between 8000 and 10,000 meters) the directions of maximum utilization are those of the extremes of the sectors of maximum offense.

(2) At inferior distances the directions of maximum utilization are those to which the maximum defensive capacity of the armor corresponds.

Naturally it is not intended to establish the rule that a ship must always keep the enemy bearing in one of the four directions of maximum utilization that are determined in this way; it is only insisted that these directions constitute *an element of the highest importance for tactical maneuvering.*

CHAPTER II.

RADIUS OF ACTION OF THE TORPEDO.

6. *Conditions of the Problem.*—The introduction into use of torpedoes having a speed of 31 knots an hour over a run of

nearly 6500 meters is announced; in what we say we shall have reference to this advanced type of weapon.

The inferior limit of long-range combat is given to us by the radius of action of the torpedo, the determination of which is therefore indispensable in order to proceed with the study of the tactics; the more so since the improvements in the torpedo seem to give reason for the belief that this weapon has almost completely invaded the field of the gun. It appears permissible to think so for the following reasons:

(1) The increase in the tonnage of battleships implies that they may be very long in order to enable them to reach high speeds.

(2) The launching distance may be greater than the run of the torpedo when the ship attacked is moving in the direction of the torpedo.

(3) Conceding that there may be scant probability of success in launching from a great distance against an isolated ship, we may at any rate rely upon the launching of torpedoes against an assemblage of ships.

It is of interest to estimate the importance of these matters, taking as a basis the following axiom: "A weapon, the action of which cannot be repeated except at considerable intervals of time, and of which the supply is very limited, must be employed only under conditions that may assure a notable probability of hitting." *

7. *Relation Between the Length and the Duration of the Run.* —The engine of the torpedo is devised for the maximum speed. Since we desire to determine the radius of action of the torpedo, admitting that this weapon may realize the best requisites to-day conceivable, let us suppose that the type of torpedo capable of running over 6500 meters at an average speed of 31 knots an hour, may have as a maximum speed per hour about 50 knots; and let us seek a relation that, within these limits of speed, may

* On the basis of this axiom, when the heavy guns had a very slow rate of firing, they were justly held to be unadapted for employment at the maximum fighting distances; these same cautions are to-day imposed upon the employment of the torpedo. Although there exists the possibility of a lucky hit when launching the torpedoes with small probability of hitting, we must keep in mind the necessity of being ready to launch when, owing to the closing of the distance, the probability of hitting is greatly increased. (Author's note.)

permit us approximately to calculate the duration of the run as a function of its length.

Let c be the length of the run expressed in meters; v the corresponding speed in meters per second; $t = \frac{c}{v}$, the duration of the run.

The ratio between the weight of air consumed during the run and the duration of the run itself, expresses the consumption of air in one second.

The weight of air consumed during the run is the difference between that which is contained in the charged tank, and that which remains therein at the end of the run. The latter is greater the higher the working pressure. Consequently, if, after a run of less than 6500 meters, we suppose the tank to contain the same weight of air that remains therein after a run of 6500 meters, we commit an error, by virtue of which, for a given speed, we shall be led to attribute to the torpedo a run greater than the actual run. Under the supposition mentioned, indicating by A the quantity of air consumed during the run, a and a_0 being the amounts consumed in 1 second corresponding to the times t and t_0, we have

$$a = \frac{A}{t}, \quad a_0 = \frac{A}{t_0},$$

and hence

$$\frac{t}{t_0} = \frac{a_0}{a}.$$

F and F_0 being the indicated horse-powers for the speeds v and v_0, corresponding to t and t_0, the value of $\frac{a}{F}$ (that is to say, the consumption per horse-power in 1 second) continually increases the more the speed differs from that for which the engine was designed. In supposing that

$$\frac{a}{F} = \frac{a_0}{F_0},$$

if a_0 and F_0 refer to the maximum run, we thereby commit an error which, for a given speed, would lead us to attribute to the torpedo a run shorter than the actual run.

Taking the two preceding hypotheses together, that is, holding that

$$\frac{t}{t_0} = \frac{F_0}{F},$$

we are able to admit that the two errors mentioned may compensate each other. As, on the other hand, we may hold that the power varies approximately as the cube of the speed, we obtain

$$\frac{t}{t_0} = \left(\frac{v_0}{v}\right)^3.$$

By means of this equation, knowing by experiment that v_0 corresponds to t_0, we can deduce the time t for a speed v. Letting c and c_0 be the runs corresponding to t and t_0, we have

$$v_0 = \frac{c_0}{t_0}, \quad v = \frac{c}{t},$$

and, substituting in the preceding equation, we obtain

$$t = t_0 \left(\frac{c}{c_0}\right)^{\frac{3}{2}},$$

which is the equation sought; it shows that the duration of the run varies approximately as the $\frac{3}{2}$ power of the run of the torpedo.*

* To prove that the formula thus found is sufficiently trustworthy, we have recourse to the data of the experiments carried out in 1897 by Makaroff, who was the first advocate of long distance launching (*Cfr. Questioni di Tattica Navale,* trad. Saint-Pierre). Taking for c_0 and t_0 the values relative to the greatest run, we here set down the experimental and the calculated results:

c (experimental)	Speed per hour	t	c (calculated)	Errors
(meters)	(knots)	(seconds)	(meters)	(meters)
2774	11	504	....	....
2134	14	305	1985	— 149
1280	18	142	1192	— 88
640	23	55	633	— 7

For a modern type of torpedo we refer to data supplied by "Engineering" of Feb. 14, 1908, concerning the 18-inch, hot-air, Whitehead torpedo:

c (experimental)	Speed per hour	t	c (calculated)	Errors
(meters)	(knots)	(seconds)	(meters)	(meters)
3656	28	261	....	....
2742	32	171	2766	+ 24
1828	38	96	1877	+ 49
1371	40	68	1491	+ 120
914	43	42	1072	+ 158

(Author's note.)

Putting $c=6500$ meters, $t=\frac{6500}{15.5}=419$ seconds (15.5 being the speed in meters per second corresponding to that of 31 knots per hour), we obtain the formula

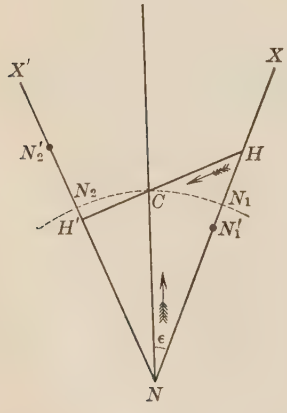
$$t=0.0008c^{\frac{3}{2}},$$

with which the following table is calculated:

c (meters)	t (seconds)	speed per hour (knots)
6500	419	31
6000	372	32
5500	326	33
5000	283	35
4500	242	37
4000	203	39
3500	166	42
3000	131	46
2500	100	50

8. *The Case of Two Vessels Opposed to Each Other.*—Let us determine successively: (1) The consequences of an error in the estimation of the direction in which the target is moving. (2) The consequences of an error in the estimation of the speed of the enemy.

(1) Evidently, an error $\pm\epsilon$ in the estimation of the course of the target would be included in a sector having an amplitude 2ϵ; the probability of hitting resulting from this for the torpedo will be so much the greater the nearer the torpedo's track approaches to a direction perpendicular to the bisector of the said angle 2ϵ. For the purpose which we propose for ourselves, it will be sufficient to refer to the case of a perpendicular impact.*



* Let XNX' be the sector with an amplitude 2ϵ which has for its vertex the position N of the ship at the moment of launching the torpedo; HH', the track of the torpedo, which accordingly has a forward angle of impact. If the course of the ship were NC, the torpedo would strike it at C. If, instead, the course were NH, at the moment at which the torpedo is at C the ship is on the arc of a circle with its center at N and with a radius, NC, which cuts the lines NX and NX' in the points N_1 and N_2 respectively; consequently on the arrival of the torpedo at the points H and H', the ship will be respectively at positions N'_1 and N'_2. The mean miss

Let N (Fig. 2) be the position of the ship at the moment at which the torpedo is launched, which torpedo would strike the center of the ship at C when the ship follows the track NC, normal to the path HC of the torpedo. If, instead, the course were NH, deviating by an angle ϵ toward the launching tube, in the time t in which it would have arrived at C, the ship will be in a position, N_1, such that $NN_1 = V_N t$; V_N being the speed of the ship in meters per second.

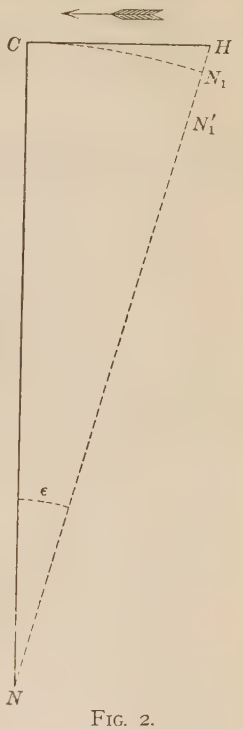


FIG. 2.

The ship will then be at a distance

$$N_1H = NH - NN_1 = V_N t\left(\frac{1}{\cos\epsilon} - 1\right)$$

from the point H at which the course crosses the track of the torpedo.

But the torpedo arrives at H at an instant which precedes that of the arrival of the ship at N_1 by an interval of time, $\frac{CH}{v}$; hence, when the torpedo is at H, the ship will be at a point, N'_1, such that

$$N'_1N_1 = \frac{CH}{v} V_N.$$

CH being equal to $tV_N \tan\epsilon$, if we indicate the amount of the miss by s, there results, then,

$$s = N'_1H = V_N t\left(\frac{1}{\cos\epsilon} - 1 + \frac{V_N}{v}\tan\epsilon\right).$$

---

will hence be

$$\frac{N'_1H + N'_2H'}{2}.$$

It is readily seen that the nearer HH' is to being perpendicular to NC, the smaller are N'_1H and N'_2H'; therefore the mean miss diminishes and the probability of hitting increases.

It is now necessary to bear in mind that the particles of water which accompany the ship in its movement, in the case of a forward angle of impact, tend to place the torpedo perpendicular to the ship, or to insure the functioning of the firing pin; while in the case of an angle of impact abaft, the torpedo tends toward a course parallel to that of the ship. Therefore it must be held that the ideal condition for the torpedo is that with an angle of impact of 90°, because to that angle there corresponds a mean miss less than for a forward angle of impact, and there is no doubt of the functioning of the weapon. (Author's note.)

Considering ϵ to be negative in the case in which the course deviates toward the side opposite that of the launching tube, the preceding formula expresses in a general way the value of s, which is negative when the torpedo passes abaft the center of the target.

Indicating the length of the ship by L, in order that there may be a certainty of hitting the target, we must have $s \leqq \frac{1}{2}L$.

With $L = 200$ meters, $V_N = 10$ meters per second and $c = 6500$ meters, we have

$$s = \pm\tfrac{1}{2}L \quad \text{for} \quad \epsilon = \pm 2^\circ \text{ (about)}.$$

But we can have no confidence in being able to estimate the course of the ship * with a mean error less than 10°.

Always, for $V_N = 10$ meters per second, with the values of t and v that correspond to the maximum run of 6500 meters, we get

for $\epsilon = +10^\circ$, $s = +536$ meters
for $\epsilon = -10^\circ$, $s = -411$ meters
} a mean miss of 473 meters.

With $c = 3000$ meters, we get

for $\epsilon = +10^\circ$, $s = +119$ meters
for $\epsilon = -10^\circ$, $s = -80$ meters
} a mean miss of 99 meters.

With $c = 2500$ meters,

for $\epsilon = +10^\circ$, $s = +85$ meters
for $\epsilon = -10^\circ$, $s = -55$ meters
} a mean miss of 70 meters.

Hence, as the maximum value that we can suppose for L is 200 meters, we are justified in stating that, *beyond the limit of 3000 meters of run, the mean miss due to the error in the estimation of the enemy's course cannot be considered as less than half the length of the target.*

* It is to be noted that, until the recent improvements in the torpedo, there were admitted, as the mean errors in the course and in the speed of the target, the values of 10° and 2 knots respectively, reference being had to runs of about 1000 meters. With the increased runs, it is logical to recognize that the difficulties of estimating the movement of the target are increased; nevertheless, let us still hold the above mentioned values for the mean errors, so that, in this way, the correctness of our reasoning may be proved *a fortiori*.

(2) When an error, Δ, is made in the estimation of the speed of the enemy's ship, the miss s of the torpedo will be equal to the space passed over by the ship in the time t with a speed, Δ; or

$$s = \Delta t = \Delta \frac{c}{v}.$$

With an error, Δ, in order that the ship may be hit it is necessary to have

$$t \leqq \frac{\frac{1}{2}L}{\Delta}.$$

We can have no confidence in being able to estimate the speed of the enemy's ship with an error less than 2 knots; therefore, putting $\Delta = 1$ meter per second, and supposing that $L = 200$ meters, we must hold that $t = 100$ seconds is *the maximum duration of the run, with which the mean miss, due to the error in the estimation of the enemy's speed, does not exceed half the length of the target.*

In order to secure such a result with a run of 6500 meters, it would be necessary to have a corresponding torpedo speed of 65 meters per second; that is to say, a speed per hour of 130 knots, which we are very far from realizing.

Under the hypothesis of launching a torpedo against an isolated ship, this is well recognized, whatever may be the character of the improvements made in the torpedo; while the improvement in the gun is apparent when there is obtained, for a given caliber and at a certain distance, a residual velocity that previously was only obtained at a shorter distance, for the torpedo, instead of equality, we must have an increase of speed.

From the table in section 7 it is seen that $t = 100$ seconds corresponds to $c = 2500$ meters. For this run, the mean probable error due to the combination of the errors in the course and in the speed of the target will therefore be

$$s = 0.845\sqrt{70^2 + 100^2} = 103 \text{ meters.}$$

It is well to bear in mind: (1) That the miss calculated for the errors in the course has reference to the most favorable conditions for the torpedo. (2) That the torpedo is affected by a multiplicity of accidental causes of misses. In consequence of which we may hold that this weapon can have a sufficient probability of hitting an isolated ship, only when the mean probable

error depending upon the errors in the course and in the speed of the target, does not notably exceed the value of $\frac{1}{2}L$, which corresponds to a probability of hitting of 50 per cent.

It seems, then, that we may logically affirm that *the actual profitable run of the most improved torpedoes cannot be set down as greater than 2500 meters.*

Since, as is well known, the angle of 30° may be held to be the minimum angle of impact of the torpedo, the maximum launching distance SN (Fig. 3) against a ship in a position, N, with a

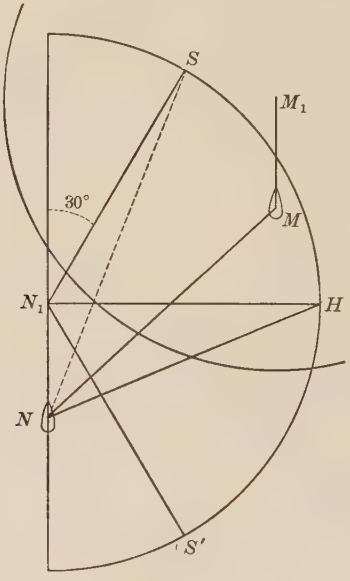


FIG. 3.

speed $V_N = 10$ meters per second, may be obtained by constructing a triangle, NN_1S, in which

$$NN_1 = V_N t = 1000 \text{ meters},$$
$$NN_1S = 150°,$$
$$N_1S = 2500 \text{ meters}.$$

From this triangle we find $SN = 3400$ meters.

Let it be noted that the speed supposed for N is not small, and that the launching distance would be less than that obtained whenever N might have S bearing in a sector of maximum offense of the guns. We may therefore affirm that, in the case

of an isolated ship, the radius of action of the torpedo is to be set down as less than 3500 meters; or in other words, *beyond the distance of 3500 meters from the enemy, a ship may maneuver without troubling itself about torpedoes.*

9. *The Danger Zone* (Fig. 3).—The geometrical locus of the positions from which torpedoes may be launched to strike the ship after a run, c, is obtained by making $NN_1 = V_N t$, describing a circle with its center at N_1 and with a radius c, and then limiting to the right and left of the ship, the arcs—as SS'—included between the two straight lines passing through N_1, and which form angles of 30° with the course.

Any such circle includes within itself the circles corresponding to shorter runs. Indeed, the difference $c - V_N t$ diminishes with t; and hence, indicating by c' and t' two other corresponding values of the length and the duration of the run, when $t' < t$ we shall have

$$c - c' > V_N(t - t').$$

The difference between the radii of the two circles considered is therefore greater than the distance between the centers; or, the two circles have no points in common.

The circle traced for the greatest run to which corresponds a sufficient probability of hitting, therefore includes *the danger zone* with respect to the torpedoes.

The eccentric position of the ship in this zone so determines matters that a combatant may find himself within the radius of action of the enemy's torpedoes, without having the enemy within the radius of action of his own torpedoes. Thus, in Fig. 3, the ship N has the enemy M in his danger zone, while it is itself outside of the zone of M (which has a center at M_1, such that $MM_1 = NN_1$). This leads to the establishment of *the preference that is possibly to be given to bearings abaft the beam,* in the field of the torpedo.

10. *Concentration of Torpedoes.*—The circle, traced as above described for the maximum run of the torpedo (6500 meters), limits the danger zone for the concentration of torpedoes. This zone is greatly extended forward of the ship's beam; indeed, the launching distance NS, corresponding to the minimum forward angle of impact, is even slightly greater than 10,000 meters, for the ordinary speed of 20 knots per hour, which, at present, it is well to hold as the mean battle speed.

By virtue of what has been said in section 8, we observe that, at the limit of this danger zone, the percentage of effective torpedo hits is very small. We have seen, in fact, that to a mean error of 10° in the course of the target, there corresponds a mean miss of 473 meters; and that for an error of one meter per second in V_N we have a mean miss of 419 meters; hence, the probable mean error that must be reckoned upon in virtue of the two partial errors aforesaid, is 534 meters. The 50 per cent stretch is thus 1068 meters, and the percentage of effective hits against a ship 200 meters long, is, then, 10 per cent.

On this basis, there would appear to be rational a concentration, which, however, should be executed with at least five torpedoes; thus having the probability of obtaining the result that may be expected from a single torpedo, launched for a run of 2500 meters.

This cannot be accepted unconditionally; in fact, the above mentioned value of the miss, due to the error in the course of the target, has reference to the hypothesis of a perpendicular impact. The miss increases with the obliquity of the impact, and besides, it must be remembered that, with the same length of run for the torpedo, the error committed in the estimation of the course and of the speed is evidently greater the greater is the launching distance.

It seems logical, then, to admit the possibility of having, with a run of 6500 meters, 10 per cent of effective hits, when, however, the impact is normal.

The position H, from which a hit with normal impact can be made with a run of 6500 meters, is found to be at a distance of 7500 meters from the ship.

It is clear that, from this distance, the ship N can render impossible the concentration of the torpedoes of several ships by means of an opportune hindrance of their maneuver; so disposing that the enemy's line may not be a secant of the danger zone in the segment occupied by the formation.

This hindrance may be determined by deducing graphically the maximum launching distances for the different bearings from the ship's head, which permits fixing the idea in the following manner: In order to have the certainty of rendering impossible the concentration of torpedoes, the enemy's ships must not be brought to bear at less than a certain angle from the bow, which

angle is respectively 60°, 90° and 120°, for ships distant about 7500, 4500 and 3500 meters.

It is well to observe that, for the concentration of torpedoes, two conditions are required: (1) The line of formation of the ships launching the torpedoes must be suitably inclined with respect to the line joining it with the adversary.

(2) The course of the latter must be favorable to the launching, and it must be kept exactly constant for the duration of the run of the torpedo; a duration that, for long runs, is very considerable.

Since, in a combat between battleships, we cannot, as in the attack of torpedo boats, count upon a surprise for taking up an advantageous position, it is not very probable that the two conditions above mentioned can be realized at one and the same time.

It seems allowable, then, to conclude that, although the concentration of the torpedoes of several ships may not be absolutely prevented within the radius of 7500 meters (and this renders it advisable not to bring the enemy to bear in the neighborhood of the bow), still, there is no great cause for apprehension concerning it; and, reciprocally, it is not well to rely too much upon this employment of the weapon.

11. *Launching Against an Assemblage of Vessels.*—As is well known, on the basis of the theory of probabilities, a target, the extent of which in a certain direction is four times the length of the 50 per cent stretch, includes all the shots.

In the preceding section, it is seen that a 50 per cent stretch, about 1000 meters long, corresponds to the maximum run of the torpedo; consequently, all the shots are included in a formation that extends at least 4000 meters normally to the mean track of the torpedoes.

The launching must be directed to strike the center of the formation; and, naturally, from what has just been said, its success must depend upon the course of the ships attacked, with a probability that the track of the torpedo may cut the formation in one of the vacant spaces. It is well to note that, for formations in single line and at a distance of 500 meters between the centers of two adjacent ships, in the most favorable case of $L=200$ meters, the said vacant spaces amount to about three-fifths of the total line.

Hence, we may not exclude the case that some ship may be in a position for launching with a fair probability of hitting, but it

is not well to rely upon launchings by several vessels against the enemy's assemblage, unless the formation of the latter is of extraordinary length, or unless he adopts a bow and quarter-line formation, and unless his course is favorable.

In employing torpedoes, either with a view to concentration or when considering the enemy's fleet as a single target, it is well to bear in mind that we face the following dilemma: either we launch from a long distance and very probably only waste torpedoes, or we launch from a distance somewhat greater than the limit established for the case of two ships opposed to each other, and so run the risk of being found unready to launch them within the really effective radius of the weapon, should the distance rapidly be shortened in an unforeseen manner.

In conclusion, beyond the range of 3500 meters determined in section 8, the employment of the torpedo may not be excluded, but is only occasional; so that, from the point of view of the defense, there is no occasion to trouble oneself very much about it; and from that of the offense, it is well not to sacrifice, even in a minimum degree, the employment of the gun.

CHAPTER III.

ADVANTAGEOUS POSITIONS.

12. *Alignments.*—The formation of a fleet of ships is defined by the lines joining the units of the formation, and by the angles that these lines make with the direction of movement.

The study of tactics cannot be reduced to that of fixed formations, the importance of each single formation not being absolute but relative to the situation of the moment.* The idea, then, that the formations are to be considered as consequences of the maneuvers, having the objective of acquiring or maintaining determined relative conditions of position with respect to the enemy, must be held to be fundamental. From this arises the necessity of fixing in the mind the advantageous positions in long-range combat, and of doing this in a way that, as far as possible, may be independent of the formations.

* "C'est moins l'ordre qui a de l'importance, que la position relative des combattants; . . . . tout l'effort doit tendre à donner à ses forces une position de combat favorable." Daveluy, *L'esprit de la guerre navale—La tactique*, 1909.

In order to obtain such maximum generality of reasoning, it is principally necessary to have reference to the relative position of the lines of the enemy's formation, supposing the inclination of the ships on their respective lines to be variable.

Naturally, it is necessary to take into account the length of the various segments of the line occupied by each party. To the geometrical figure composed by these segments we will give the name of *alignment* (*schieramento*).

A few definitions are necessary concerning the various kinds of alignment that it is well to distinguish, in relation to the hypotheses that we shall have to consider.

We say that a naval force has a *double alignment* when its ships are arranged on two adjacent parallel lines; the alignment of a naval force is *simple* when it is in single line.

Alignments may be rectilinear and curvilinear; we will call *angular* the alignments composed of two rectilinear segments that are not prolongations of each other.

When a naval force maneuvers by separate groups, by *alignment of the naval force,* we mean that composed by the segments that join the centers of the single groups; the alignment of each group being defined in the manner above stated.

By *the inclination of a rectilinear alignment* we mean the angle formed by the alignment and the line joining its center with the center of the enemy's alignment.

13. *Zones and Sectors of Offense.*—In order to fix these ideas, let us first of all suppose that we have, in column of vessels (Fig. 4), a naval force composed of ships whose sectors of maximum offense extend 45° forward of and 45° abaft the beam. It is clear that if we draw from the leading ship the straight lines *AH, AH',* making angles of 45° from the bow; and from the rearmost vessel the straight lines *CK, CK',* making angles of 45° with the direction opposite that of the course, these lines, and the length of the formation, limit the zones *HACK, H'ACK',* which are those of maximum offense, when, however, the ships do not all fire at one and the same target.

Rigorously, from the above-mentioned zones it would be necessary to subtract those of minimum offense, *ADB, BEC,* . . . . but it is evident that these need not be taken into account except at short distances.

The said zones *HACK, H'ACK'*, and the corresponding sectors of minimum offense, *HAH', KCK'*, refer to the case of *the distribution of the fire;* while it is evident that, under the hypothesis of the *concentration of the fire,* the sectors of minimum offense—for the formation under consideration—are wider, and the zones of maximum offense are more restricted.

As, for a ship, we distinguish the sectors of maximum, and those of minimum offense, so, for any formation, there exist *zones of maximum offense,** and *sectors of minimum offense.*

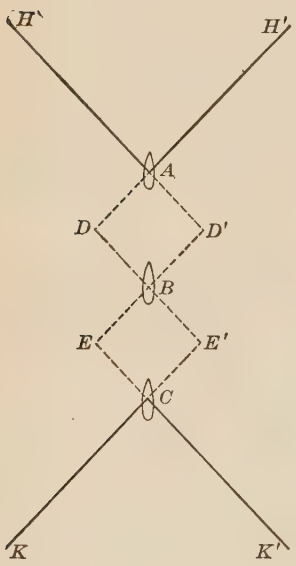


FIG. 4.

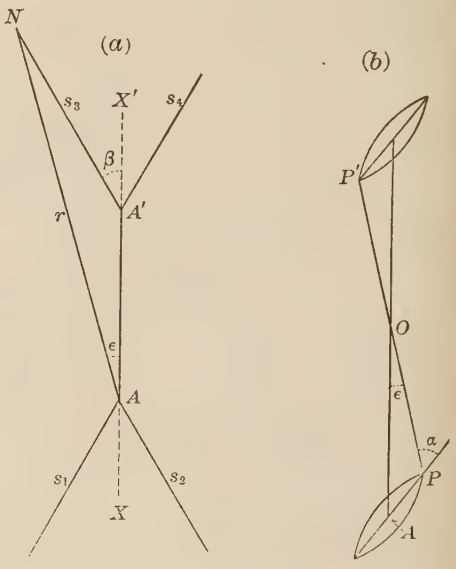


FIG. 5.

If, instead of to a special formation, we refer to the alignments in general, the amplitude of the zones of maximum offense are determined, taking into account the inclination of the ships which is most opportune for diminishing the amplitudes of the sectors of minimum offense. With this object, given a simple rectilinear alignment, *AA'* (Fig. 5a), the inclination just mentioned is determined by the limit condition that each ship, firing in an extreme

* We say *zones,* and not *sectors,* as in the case of a ship, because, if the ship may tactically be considered as a point, the length of the formation is anything but negligible. (Author's note.)

direction of a sector of maximum offense (the angle which this direction makes with the longitudinal axis we will call α), tangents the ship adjacent. Indicating by ϵ (Fig. 5b) the angle thus made between the alignment and the direction of the plane of fire, with d as the interval between ships and with L as the length of each ship, from the triangle OAP (O being the point in which the alignment intersects the line PP' joining the extremities of two adjacent ships) we have

$$\frac{\sin \epsilon}{AP} = \frac{\sin \alpha}{OA},$$

and hence

$$\sin \epsilon = \frac{L}{d} \sin \alpha,$$

from which, with the mean data ($L = 150$ meters, $d = 500$ meters, $\alpha = 45°$), we obtain $\epsilon = 12°$; for safety's sake let us say $\epsilon = 15°$.

From this it follows that, if we draw from the extremities of the alignment four right lines forming angles of 15° with the prolongation of said alignment, we determine the zones of maximum offense and the sectors of minimum offense; in the case, however, in which it is not required that the offense of several ships shall converge upon one and the same target.

When this last condition is established, it must be borne in mind that, beyond a certain limit, the greater the number of ships that take part in the concentration, the smaller is the effect of the firing.

This diminution of effect cannot be considered if the concentration is evidently imposed by special conditions of position; but, in general, it is necessary to limit the number of ships destined to fire at one and the same target.

There is no difficulty in admitting that the fire of three or four ships may be concentrated. Without entering into the methods for the control of the firing during concentration, one datum to be remembered is that Togo, who at Tsushima had 12 armored ships, has written in his report that he concentrated his fire upon two of the enemy's units; hence it seems permissible to believe in the concentration of the fire of six units also, and, without experience to the contrary, it is well to hold this number of units to be the maximum.

On this basis, in the case of the concentration of the fire, it is well to consider the alignment as divided into elementary parts,

each having the length $(n-1)d$; n being a number of ships not greater than six. AA' (Fig. 5a) being one of these parts, we form the triangle $AA'N$, wherein $NAA'=\epsilon=15°$, and N indicates the position of a hostile ship at a distance $r=NA$ from the most distant point of AA'. Indicating by β the angle $NA'X'$ formed by NA' with the prolongation of the alignment, it is clear that the lines s_1, s_2, s_3, s_4, drawn from A and A', making angles β with AX and $A'X'$ respectively, determine the zones of maximum offense for the supposed value of r.

With a value of r anywhere between 10,000 meters and 6000 meters, β is about 20°; and the difference $r-r'$ is about 2000 meters (r' being the distance of N from the nearest point of AA').

14. *Concentration and Distribution of the Fire.*—Let us suppose that one of the combatant parties, which we will indicate by C, concentrates his offense; while the other, which we will call R, directs the offense of each ship against a ship of the adversary. The party C secures tactical and strategical advantages, because R is hampered in his movements owing to one of his units having the sum of all the injuries that, on the other hand, are distributed among the different units of C. It would then appear logical to establish the concentration of fire as a tactical objective, executing this concentration successively upon the various units of the enemy, changing the object of concentration whenever one is put out of action. Thus, one group of ships, with respect to another hostile group, should concentrate the offense upon one ship; and several groups should endeavor to concentrate their offense upon one and the same group of the enemy.

This seems to be confirmed by history. Indeed, the objective of the two greatest tactitians of the sailing period, Suffren and Nelson, was the concentration of forces; it must be remembered, however, that they attacked a part of the enemy's line, relying upon overcoming it before the remainder of the forces could come to its aid. This reliance was justified: (1) by the slowness of the movements of the sailing ship; (2) because the fighting could not be efficacious unless the vessels came broadside to broadside with those of the enemy. It resulted from this that *the forces not attacked were placed under conditions of non-offense for a time sufficient to secure decisive results.*

Naturally, the advisability of concentration is indisputable

to-day as in the past, when we have conditions of position analogous to those pointed out; or when the part of the enemy against which the offense is not directed is in a position of inability to offer offense; that is, when our own forces are in a sector of minimum offense of the enemy's alignment. The analogy also exists when a part of the enemy's force is so distant with respect to the remainder as to offer a sensibly less efficacious offense. In other words, the advisability of concentration is clear when, with respect to the enemy, we have an advantageous position.

Definitions.—When an alignment has not the advantage of being in a sector of minimum offense of the enemy, it may be said that, with respect to the said enemy, its position is tactically advantageous, or equivalent, or disadvantageous, according as—supposing the enemy's offense to be concentrated in the best manner—it permits of executing the firing at distances less than, equal to, or greater than those at which the enemy fires.

With equivalent alignments it must be remembered that, in concentrating the offense, the ships at which we do not fire are in conditions of tranquillity; and hence there exists the advisability of distributing the fire, because the offense offered is also a reciprocal function of the offense received.

This last advisability cannot be considered when the distance exceeds a certain limit, which it seems should be placed at 8000 meters; in such case concentration becomes a necessity, to the end that the offense may be efficacious, and its results may quickly be tangible; and this, remembering that, as the distance increases, the probability of hitting rapidly diminishes.

Under such conditions it is then indispensable to prescribe that the ships of one and the same group (taking into account the limits pointed out in the preceding section) shall concentrate their fire upon one of the enemy's ships; this, however, does not imply the advisability of two groups of ships having for objects of concentration two hostile units forming part of the same group, when our own groups are not in a sensibly advantageous position with respect to the enemy's groups. Indeed, the convenience of distributing the fire must here be considered analogously to what has been set forth above; besides, the tactical necessity of dividing the ships into groups according to the standard of homogeneity is evident. So, then, having two units damaged in one of these groups, a combatant has his maneuver-

ing qualities reduced in that group only; while, if the damaged units form parts of two different groups, the maneuvering qualities of the whole fleet undergo a reduction notably greater.

In conclusion, we may formulate the following general criteria, the application of which is naturally subordinated to the necessity of not often changing the objective that it is sought to secure:

(1) At the maximum fighting distances it is necessary for the ships of each single group to concentrate their fire.

(2) When the distance is below a certain limit (8000 meters), it is best to distribute the fire, unless one has a sensible advantage of position, sufficient to render concentration advisable.

(3) In concentrating the fire from equivalent positions, the enemy's ships which are the object of concentration should preferably belong to different groups.

ELEMENTARY ALIGNMENTS.

15. *The Ship Upon Which to Concentrate.*—For the analysis of the advantages of position, let us refer, first of all, to the hypothesis of elementary alignments; or to simple, rectilinear alignments of a length not exceeding 2500 meters, necessary for six ships placed at intervals of 500 meters. At the present time this distance is to be considered as normal, by reason of the high speed and the dimensions of the battle units. From what has been noted in section 13, it is possible to concentrate the fire of all the ships of the alignment upon a single enemy's ship.

When not otherwise indicated it will be understood that the length of the adversary's alignment is supposed to be the same.

The natural target for each ship is evidently the nearest; or, it is that which is found at the foot of a perpendicular dropped from the ship upon the enemy's alignment. It follows from this that, except under special circumstances, the most opportune ship for the concentration of fire must be held to be the one that is nearest to the center of the projection of our alignment upon that of the enemy.

It is also necessary to take into account the importance of *continuity* in the concentration of the offense. From this results the advisability that the enemy's ship upon which the fire is concentrated should be at an extremity of the alignment; which,

in its turn, we shall see confirmed when we come to discuss the maneuvering.

We establish, then, that in general *the enemy's ship for concentration should be the extreme one which occupies the position nearest the center of the projection of our alignment; or, such ship is the extreme one on the side on which the inclination of the enemy's alignment is less than 90°.*

By this rule we may determine the ship for concentration, unless the inclination of the enemy's alignment to the line joining the centers is 90°. There may then arise two cases: (1) Our own alignment is also normal to the line joining the centers. (2) Our alignment is not inclined 90°.

In the first case it evidently makes no difference upon which extremity of the enemy's alignment we concentrate.*

In the second case, firing upon the extremity which is toward the point where the alignments converge, it is discovered that, with respect to the other extremity, the limits between which the firing distances are included are wider. Moreover, it may not always be possible to concentrate the offense upon the aforesaid extremity, which may be in a sector of minimum offense; while a certain advantage in fire control may result the more nearly we approximate to uniformity of distance. In any event, in the case to which we now have reference, the proper extremity is not precisely designated by the conditions of distance, and hence is selected on the basis of the objectives of the maneuvering.

16. *Inclination.*—It is easy to discover (see Fig. 6) that, to an alignment, A_1A_2, normal to the line joining its center C_A with the center C_N of the enemy's alignment, N_1N_2, we can oppose only an equivalent, or a disadvantageous alignment. In fact the party N may have an alignment normal to C_AC_N, and then the

*It is to be noted that if we were to concentrate the fire upon the enemy's center, rather than on an extremity, the firing distances would not be sensibly different. Calling r the distance between the centers, rm the mean firing distance, for alignments 2500 meters long, we obtain the following:

VALUES OF rm.

r.	Firing on the center.	Firing on an extremity.
8000 meters	8045 meters	8200 meters
6000 meters	6065 meters	6250 meters

(Author's note.)

alignments are equivalent; or, it may assume an alignment differently inclined, as in the figure. In the latter case, from what has been said in the preceding section, the ship for the concentration of the A party is N_1; and that for N is A_1, it being supposed that the angle $N_1C_NC_A$ is not too small. Drawing from N_1 the perpendicular N_1P_A to A_1A_2, the firing distances for A are between P_AN_1 and A_2N_1; and those for N are between N_1A_1 and N_2A_1.

We have

$$N_1A_1 > P_AN_1.$$

The two triangles $N_2N_1A_1$ and $A_2N_1A_1$ have the side N_1A_1 in common; the sides N_2N_1 and A_2A_1 are equal; the angle

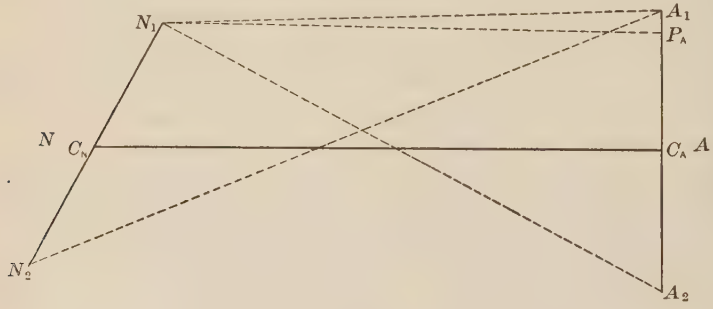


FIG. 6.

$N_2N_1A_1$ is obtuse, while $N_1A_1A_2$ is acute; hence

$$N_2A_1 > A_2N_1.$$

Analogously it is demonstrated that the firing distances of N are also greater than those of A when the firing is concentrated upon A_2.

The alignment of the party N is therefore a disadvantageous one, conformably to the proposition enunciated; from which we quickly draw the following deductions: (1) If the enemy's alignment is not normal to the line joining the centers, our assuming an alignment normal to the said joining line places us in an advantageous situation. (2) Of the two alignments, the situation of the one whose inclination to the line joining the centers is nearest to 90°, is the most advantageous. (3) With equal inclinations to the said joining line there is equivalence. It is worth while to note that, when this is realized, the angles that the lines

joining the corresponding vessels make with their directions are equal.

The inclination to the line joining the centers generally constitutes the best guide for estimating the advantages of position.

Definitions.—To the position of the alignment inclined to 90° to the line joining the centers we give the name of *fundamental tactical position.*

We say that an alignment *crosses the T* (or is in position to *T*) when it is in the enemy's sector of minimum offense.

For *crossing the T,* that inclination which permits having the minimum firing distances, would seem to be the best; in other words, in penetrating into the enemy's sector of minimum offense, it would be necessary to incline our alignment, at the extremity nearest that of the enemy, as far as the limit of his zone of maximum offense. Let us consider (Fig. 7) wherein $\beta = XA_1N_1 = YN_1A_2$ is the angle of which mention was made in section 13; this shows an alignment of A that crosses the T. The alignment N_1N_2 may still fire upon A_2, but A is in a momentary situation that is very advantageous, because its firing distances, putting $r = N_1A_2$, are practically included within the limits, r and $r - 2000$; while for N, the distances are between the limits, r and $r + 2000$.

But, in order to escape from this disadvantageous position, it is enough for the party N to rotate his alignment in a way which will permit him to fire upon A_1; in other words, in order that the positions may be equivalent, it is sufficient for the party N to rotate his alignment through the angle $N_2N_1N'_2 = A_2N_1A_1$; a greater rotation produces an advantage for N.

It is seen, then, how easy it is to eliminate the advantage of A when the T is crossed in the manner indicated; it is well, therefore, to seek to secure an advantage which, although smaller, may be maintained for a longer time. It is evident that the position of N will be so much the longer defective, the greater the amplitude of the rotation necessary to establish equivalence. It results from this that *the advantageous alignment for crossing the T is the fundamental one,* A_2F.

It is clear that, with alignments of different lengths, the shorter one is in a theoretically advantageous position, not only when, with respect to the enemy, it has an inclination nearer the fundamental one, but also, when it has an inclination equal to that of the enemy.

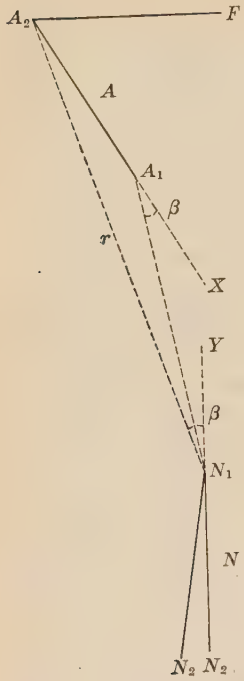


FIG. 7.

In the practical cases, the difference in length between two alignments that are not very different in strength cannot be very great. The difference in the number of ships may be one or two; and hence the difference in length may be 500 or 1000 meters; and since only a small part of it can affect the conditions of position, its influence appears to be negligible.

17. *Equidistant Positions.*—In this part of the subject, in studying the momentary situations—although without entering into an examination of the movements—it is necessary to keep in mind as a guide the practical object sought.

The deductions drawn in the preceding section have real practical importance, because they permit us to estimate whether it is better to change the alignment, and if so, how.

Except in special cases, even if two adversaries move, keeping their rectilinear alignments unchanged, evidently their inclination to the line joining their centers changes. Since a rectilinear alignment cannot be instantly changed, it appears necessary, as a compliment to the deductions just mentioned, to seek for a form of alignment that closely approximates to the fundamental one, and that, with respect to the line joining the centers, can easily and continuously be maintained.

To this we come with the following observations:

(1) An elementary alignment in the arc of a circle having for its center an enemy's ship, may practically be considered as a rectilinear alignment normal to the line joining its center with the aforesaid enemy's ship.

(2) Two adjacent ships of an alignment may be said to be on the arc of a circle having an enemy's ship for a center, when, for each one, the straight lines joining them respectively with the friendly ship and with the hostile ship, form an angle of about 90°.

(3) It is well known that the simultaneous change of course of several ships must of necessity be successive at very short intervals of time; each ship having to wait for the movement to be begun by the ship next within, on the side toward which the change is made. From this it follows that, in the tactical steering of an elementary alignment, the extreme ships are to be considered as regulators; inasmuch as we can conceive that, while one of them completes the movements of the change of course in a wide sweep, the others may imitate them in a continuous manner, tending to maintain the parallelism of the courses. This being the case, on the basis of the two preceding observations, it appears advisable to consider what alignment is obtained *if every ship continually maneuvers with the criterion of considering itself in position when the angle between the line joining it with the*

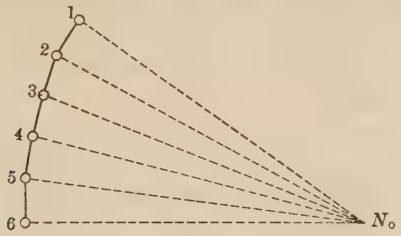


FIG. 8.

adjacent ship on the side toward the regulator, and that joining it with the enemy's ship of reference, is 90°.

The form of alignment is that indicated in Fig. 8; this form is a broken equilateral one, with the inclination of its sides to the radius vectors drawn from the pole N_0 (the enemy's ship) equal to 90°.

Distinguishing the units of the alignment by numbers from 1 to 6—No. 1 being the regulator ship—and indicating the respective distances from N_0 by $r_1, r_2, \ldots r_6$, we have

$$r_2^2 = r_1^2 - d^2,$$
$$r_3^2 = r_2^2 - d^2 = r_1^2 - 2d^2,$$
$$\ldots\ldots\ldots\ldots\ldots,$$
$$r_6^2 = r_1^2 - 5d^2.$$

With the customary value of $d = 500$ meters we obtain:

for $r_1 = 8000$ meters, $r_6 = 7920$ meters;
for $r_1 = 6000$ meters, $r_6 = 5900$ meters;
for $r_1 = 4000$ meters, $r_6 = 3840$ meters.

Within the limits of long-range battle—the difference $r_1 - r_0$ being thus absolutely negligible—the form of alignment that is obtained in the manner above indicated may in effect be held to be that on an arc of a circle, or at positions equidistant from N_0; and hence, by the first of the preceding observations, it constitutes a rectlinear alignment normal to the line joining its center with N_0.

Such a form of alignment satisfies the requisites above specified; in other words, if N_0 is the center of the enemy's alignment, and we suppose that our forces have the fundamental tactical position, this position thus appears to be susceptible of being maintained.

Reserving it to ourselves to discuss in its turn this question with regard to the maneuvering, we hold meanwhile that, in order continually to tend to the securing of the advantages of position pointed out in the preceding section, the alignment with equidistant positions with respect to the enemy's center will generally appear to be advisable.

It is readily seen that if our force is outside of the zone included between the perpendiculars to the enemy's alignment drawn from its extremities, a sufficiently advantageous form of alignment may be that with positions equidistant from the enemy's nearest extremity; and it is so much the better, the nearer the position of our center to the prolongation of the enemy's alignment.

18. *Composite Alignments.*—Two contiguous elementary alignments, one on the prolongation of the other, constitute a composite rectilinear alignment.

Two alignments of this kind opposed to each other, if of equal length and equally inclined to the line joining the centers, are in equivalent positions; because, from what has been said in sections 14 and 16, equivalence exists between the corresponding elementary alignments. It is readily seen that, for a given inclination to the enemy's alignment, the most advantageous position for our own alignment (if the condition is imposed that it be rectilinear) is the one normal to the line joining the centers; because in this way, the single rectilinear alignments are in positions nearest that of the fundamental position.

The condition mentioned (rectilinear alignment) is, however, neither necessary nor advisable. In regard to position, it is

advantageous (and it is intuitively seen that it may be desirable for elasticity of maneuvering) that each elementary alignment, while respecting the bond of compactness, be left free to incline itself in the most opportune manner. From this are derived *angular* alignments, like that of Fig. 9, in which one elementary alignment of A is normal to $C'_A\ C'_N$, and the other is normal to $C''_A C''_N$.

In practice, from what has been said concerning equidistant positions, the angular alignment may be composed of arcs of circles having their respective centers in convenient points of the enemy's line.

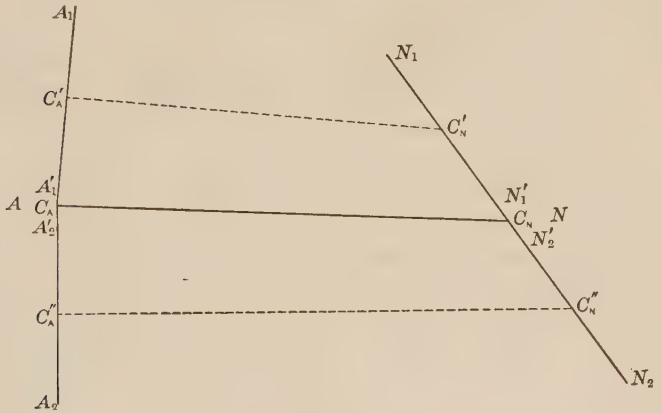


FIG. 9.

As has been noted in section 14, when the inclination of the enemy's alignment to $C_A C_N$ differs notably from 90°, the concentration of the offense of the two elementary alignments of A upon two ships of the same elementary alignment of the enemy is advisable; in such case the alignment of A becomes nearly the arc of a circle with its center in the middle of the said elementary alignment of the enemy.

On account of the disadvantages of position and the manifest difficulty of maneuvering which is encountered with alignments of great length, the hypothesis of greater lengths than those that are included in the two elementary alignments of six ships each, is logically to be excluded.

19. *Double Alignments.*—The number of ships that can maneuver in a single line being thus limited, in order to keep compact a force of greater size, it is necessary to have recourse to an align-

ment on two parallel lines, near to each other, so placing the ships in the line on the side away from the enemy, that they may fire through the intervals of the other line.

When the fleet is not very numerous, it seems logical to make use of such an expedient for reducing the length of the alignment.

It is observed, furthermore, that a group of antiquated ships, and ships deficient in protection, but yet having good speed, such as not to embarrass the tactical and strategical control of the fleet, may represent an element of offensive power that can usefully be employed against an enemy's armored fleet. In order to employ such ships, safeguarding them in order to prevent the enemy from bringing about their loss by means of a brief concentration of force, which would produce serious moral effects, one of two systems worthy of consideration is that of placing the said ships, so as to enable them to fire through the intervals of the other line. Thus we have a third case in which the double alignment may be of use.

Evidently, for such alignments, there exists the importance of the fundamental position; that is to say, there exist the principles deduced in the preceding section for simple alignments.

It is intuitively perceived, however, that, with this form of alignment, besides rendering it possible for the enemy to launch torpedoes from long distances with a certain possibility of hitting—as has been noted in the preceding chapter—we encounter other notable inconveniences with respect to a simple alignment.

(1) Diminution of the maneuvering qualities of the fleet; difficulty of taking up angular alignments.

(2) Increase of the amplitude of the sectors of minimum offense.

With the first of the inconveniences mentioned we shall occupy ourselves in Part II of our study. In order to estimate the second, we observe that, in order to fire in the intervals between the ships of the inner line, the limit of approach to the ships of the inner line by the ships of the outer line is naturally determined by the condition that the distance between ships shall not fall below the normal distance of 500 meters.

This being understood, let us determine the amplitude of the sectors of minimum offense of an elementary double alignment *abc, a'b'c'* (Fig. 10), composed of six ships in a manner analogous to that which was used in section 13 for a simple alignment.

Let us consider the triangle aba', formed by two ships, a and b, of the inner line, and by a', which fires through their interval. From what has been said in section 13, the position of a' is the limit position which permits offense in the direction of the alignment cba when there is is realized

$$ba'a = \epsilon_1 + \epsilon_2,$$

where (45° forward of and abaft the beam being the amplitude of the sectors of maximum offense of the ships under considera-

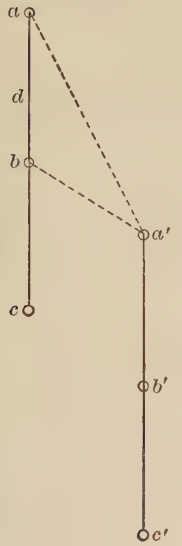


FIG. 10.

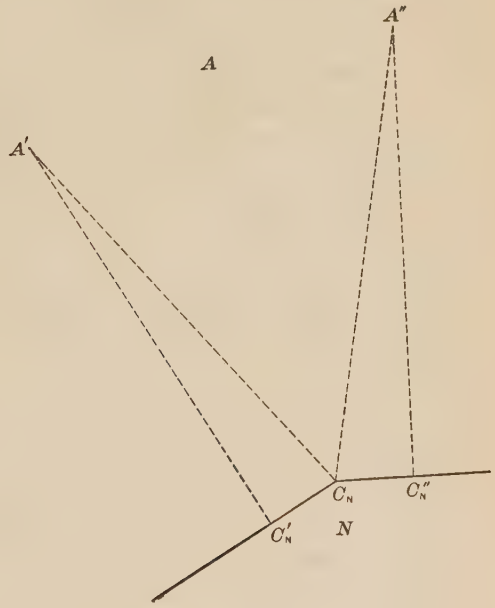


FIG. 11.

tion, and L the length of said ships) the angles ϵ_1 and ϵ_2 are deduced from the equations (section 13)

$$\sin \epsilon_1 = \frac{L}{ba'} \sin 45°,$$

$$\sin \epsilon_2 = \frac{L}{aa'} \sin 45°.$$

To the end that the offense may converge upon a single target, the value of $ba'a$ must be somewhat greater than that above mentioned. It is found by trials that the limit position of a' (which determines those of b' and c') may be held to be reached when

$ba' = a'c = d$; consequently, indicating by β (as in section 13) the half amplitude of the sector of minimum offense of the double alignment, we have $\beta = 60° - 15° = 45°$ (about), to be compared with the value $\beta = 20°$ obtained under the hypothesis of the simple alignment.

On account of the inconveniences pointed out, it seems logical to affirm that the double alignment is not to be adopted except in case of absolute necessity.

20. *Groups.*—We will now consider the hypothesis that the parties A and N, opposed to each other, are of the same strength and each formed by two elementary alignments, which, for the party A, are separated into the groups A' and A''; while N has his forces compact and on a simple alignment.

In Fig. 11 we indicate by A' and A'' the positions of the centers of the respective groups, the alignments of which we suppose to be in the fundamental positions with respect to the nearest elementary alignment of N.

If A' and A'' are at the same distance from C_N, the party N, by assuming an angular alignment with the sides respectively normal to $A'C'_N$ and $A''C''_N$, places itself in a position of tactical equivalence.

If A' and A'' are at sensibly different distances from C_N, the party N may assume an opportune alignment with respect to the nearest group and concentrate the offense on two of its ships; in this way the situation of N is advantageous. Moreover, when the angle $A'C_NA''$ exceeds 90°, it may befall that the party N can utilize the guns on both sides. It is therefore necessary to bear in mind that while in the sailing period the concentration had logically to be sought by placing the enemy between two fires, to-day the opposite is important. Naturally this consideration has no importance in case the party N is entirely made up of ships all of the principal guns of which have a field of fire on both sides.

In general it may be understood that the position of the compact fleet is so much the more advantageous the nearer it is to the line joining the groups (externally or internally).

From what has been said it results that, for the party having compact forces, we may assume conditions of equivalence and also of superiority, with respect to the other that is broken up into groups. Under the hypothesis considered, the advisability

of this last system is not excluded by this, but it is important to hold: (1) that such advisability is to be considered only in regard to the maneuvering; (2) that an echelon of groups in distance would be dangerous.

II. We will now consider the hypothesis that the forces opposing each other are equal, and that each party is so numerous that, in order to be compact, recourse must be had to the double alignment. In order to eliminate the inconveniences pointed out in the preceding section, it is possibly proper to prefer the separation of the forces into two divisions in simple alignment. In Part II we shall consider when the impossibility of doing so exists, or under what relative conditions of mobility maneuvering by groups may expose one to serious risks.

Setting aside the case in which the conditions just mentioned impose the double alignment, this may be advisable when the number of battleships at one's disposition is greater than that with which two groups may be formed in simple alignment; in fact it is well to note that *the greater the number of groups, the smaller is the probability that their movements may be co-ordinated;* and hence, in general, it seems advisable not to form more than two groups (exceptionally three), even at the cost of having recourse to the double alignment.

III. It is to be held as an axiom that, in general, it is not well to divide the fleet into groups of the same importance; rather than have two groups, both of them of small manageability, it is preferable to decide that one of them shall be endowed with special aptitude for the acquisition of advantageous positions. We reserve it to ourselves to develop, in its turn, this idea of the division of the forces into a *principal squadron* and a *flying squadron.*

Summing up, when fleets about equal in strength and not very numerous are opposed to each other, the breaking up into groups can only be advisable in order to obtain the maximum freedom of maneuvering; for numerous fleets, this expedient appears to be preferable to the double alignment. When the breaking up into groups is not rendered necessary simply by this numerical cause, the idea that prompts it may be that of attempting enveloping movements (crossing the T) by means of a flying squadron.

On the basis of the ideas advanced, the discussion of the hypothesis that both the adversaries are divided into groups is evidently simple.

In order that the battle may resolve itself into partial actions between single groups, this would have to be the purpose of both the adversaries. But, as it is logical to endeavor to concentrate the action of two groups upon a single enemy's group, the advantageous alignment (keeping in mind the relative definition of section 12) appears, in this case also, to be the fundamental one; while the echelon of groups in distance is disadvantageous unless the enemy adopts the same system.

21. *Natural Elements.*—In determining the advantages of position of two adversaries many elements enter into the account besides the situation of the respective alignments; as, for instance, the natural elements (sea, wind and sun), as well as the conditions of position with respect to the coast and to the strategic objectives.

Concerning the importance to be attributed to these elements it would be vain to pretend to formulate well-defined rules; it is clear that the values that may be given to them are to be subordinated to the necessity of having an opportune alignment in the respects already pointed out; and that holding it bound by too many conditions, signifies the creation of useless shackles. On this account we shall take only a rapid survey of the aforesaid elements.

With the sea greatly agitated, the difficulties of firing are very great; the combat may be reduced to a useless waste of ammunition, or, if there are decisive effects, the case itself may have much to do with them. Nevertheless, this does not mean that we are only to fight with a smooth sea; even with a rough sea an admiral will seek to oblige an enemy to fight if it is rendered necessary by the strategic situation; in which case, it is possibly well to avoid presenting the beam to the sea, diminishing in this way the difficulties of firing and the risk of receiving shots below the water-line. It must be remembered, however, that the gunners must be accustomed to firing under any conditions whatsoever. The situation of a fleet that, in order to obtain good fire control would be obliged excessively to hamper the maneuvering would be a sad one.

With a fresh wind in the direction of the plane of fire it is doubtful whether it is better to fight with the lee side in action or with the weather side. In the first case, at high speeds, the smoke issuing from the funnels renders the firing difficult; in the second, the smoke and the powder gases are driven back into the

turrets and casemates, the occurrence of flarebacks is favored, and the lenses of the telescopic sights may be dulled by spray. Pros and cons also exist if we consider the direction of the wind with respect to the course of the ship. A wind that blows in the direction of the longitudinal axis envelops the range finders and the observers in the tops in smoke. If the wind comes from ahead, with a fleet in column of vessels, each ship is enveloped in the smoke of the preceding one. If the wind comes from astern, the smoke hangs over the ships a long time. It seems, then, that it may be advisable to maneuver without troubling oneself about the wind. Only a ship that has the defect of having guns but little elevated above the sea could have much interest in keeping to windward of the enemy.

The direction of the solar rays may have considerable importance when the sun is only a little above the horizon, because, notwithstanding the colored glasses on the telescopic sights, having to fire with the sun in one's eyes is a grave inconvenience. It is logical to seek to escape from this situation by rotating the line joining one with the adversary in a way that tends to bring the sun at one's back. When the sun's rays make a considerable angle with the plane of fire the aforesaid inconvenience is negligible.

It is well known that the target can better be seen when it is projected upon the horizon rather than upon a coast; it may then be desirable to be between the enemy and the coast, whenever, naturally, the neighborhood of the latter does not interfere with the liberty of maneuvering.

Finally, it is clear that the position of the adversaries considered with regard to strategic centers may be of importance; but this cannot justify long maneuvering out of range, which may cause the risk of losing an opportune occasion for fighting. The candid truth which history shows us is not always remembered, is that the issue of the war depends upon the battles.

CHAPTER IV.

THE FIGHTING DISTANCE.

22. *Uniformity of Distance.*—The problem which we propose for ourselves is that of establishing the criteria proper for determining the most convenient fighting distance, or the *distance of maximum utilization.*

First of all, it is well to discard two methods that may be attractive on account of their facility for furnishing a result; for this purpose let us refer to the simplest hypothesis, that is, of the naval duel.

(1) We might seek the solution by calculating the difference that exists between the two adversaries in the total energy developed by the projectiles on impact. The distance corresponding to the most advantageous value of the said difference would be the distance required. It is clear that such a method would be absurd, since there exists no equivalence of effects with equality of dynames * developed by the different kinds of guns. Aside from this, the method would evidently be one-sided.

(2) We might place the penetrating power of the guns of each combatant in comparison with the thickness of the enemy's armor. But, in this comparison, what shall we hold to be the inclination to the plane of fire? Let us suppose our ship to be at a distance r from the enemy, who is able to pierce the side armor, when the ship presents her beam, with a projectile that, at the above mentioned distance, has a residual velocity v. If, while remaining at the distance r our ship assumes the inclination ψ to the plane of fire (counted from the beam), from what has been said in section 4 (Chapter I), this is equivalent, from the defensive point of view, to be being placed at the distance at which the residual velocity of the aforesaid projectile is $v \cos h\psi$ (where $h=1$); the offensive power, however, remains constant unless the direction ψ is outside of a sector of maximum offense. It is easy to prove that even a moderate value of ψ is equivalent to a material change of distance, which is all the greater the greater is the caliber. Hence, the inclination to the plane of fire cannot be overlooked. Wishing to apply the above-mentioned method, it would logically be necessary to suppose that the adversaries have each other bearing in directions of maximum utilization; then, however, no conclusive result could be reached with ships having large extensions of armor with thicknesses not below 150 millimeters.

In any event, the method which we are discussing would also be one-sided, because, while considering the defensive element (neglected in the foregoing) we should set aside most important elements, to which we will allude.

* Dyname = 1000 kilogrammeters. (Translator's note.)

Methods of the nature above mentioned, even if they could furnish results logically worthy of consideration in the case of two ships opposing each other, or of two groups composed of homogeneous ships, would not be applicable to the case of fleets composed of groups of ships of different types. In fact, these results would be very different for the various types, and then the legitimate consequence of such methods would be to make the various parts of the fleet fight as independent groups, echeloned at different distances from the enemy. So, then, aside from the possibility of always adopting the system of maneuvering by groups, we cannot admit the advisability of the echelon in distance for reasons discussed in section 20; on the contrary, we derive from it that the idea to be assumed as fundamental is that of *the necessity of having the various parts of our fleet fight under conditions of a uniform mean distance.*

In comparison with the system of the echelon, which might give to the tactical employment of the forces a rigidly prearranged form, the idea just enunciated appears the more rational inasmuch as, with it, we at once perceive the possibility of regulating the development of the tactical action.

In virtue of this idea, the question to be discussed appears complex; and it is proper to add that the complexity does not depend solely upon the heterogeneity of the different divisions of the fleet. Indeed, the variables of the problem do not reduce to the weapons and to the protection, but we must take into account strategic factors, and others of a moral and organic nature.

23. *The Strategic Situation and the Fighting Distance.*—The axiom with which we closed the preceding chapter must be recalled here: *The war is decided by means of decisive battles.* Ought we to draw from this the corollary that every tactical action must be pushed to a finish, or that, unless it is developed to the point of obtaining the destruction of the enemy's forces, it is unprofitable?

The question is prejudicial to the subject we have under discussion, since, if the reply is in the negative, on that basis it may sometimes be well for the fighting distance not to fall below a certain limit.

To overcome the enemy is the desire of all who fight, but in some cases a tactical victory may be a strategic defeat. Some particular examples are necessary in order not be misunderstood.

During the first period of the recent war, up to the fall of Port Arthur, the Japanese had to consider that, while the whole of their force was engaged, the enemy, even after the destruction of the first squadron in the Pacific, would be able to send a second squadron from the Baltic. Italy, in case of a war with France, given the present relative conditions of the naval forces, might be found to have a superiority with respect to one fraction of the enemy; we shall, however, have to consider that, if in the victory our forces sustain such injuries as to remain for a long time paralyzed, ours would be a Pyrrhic victory, because the adversary, although having had one of his fractions annihilated, will have acquired liberty of action with the remainder.

On the other hand, at Tsushima, Japan found herself obliged to seek the annihilation of the enemy, because that signified the complete solution of the maritime struggle. Italy against Austria would have to seek to end the struggle by one decisive battle, because, supposing that we have a total superiority of forces, every elimination of equal forces would be to our advantage. England, given the necessity of keeping open her commercial communications, and given also the development of her forces, would have to seek the destruction of the enemy. These examples demonstrate that the axiom which establishes that the object of fighting is to overcome the enemy, admits as a corollary, not the unconditional advisability of a decisive struggle, but *the necessity of pushing the fight as far toward a finish as is permitted by the strategic conditions.*

To establish firmly this postulate, it is necessary to examine the doubts that may be formulated on the basis of the principles of war on land and of naval history.

In the history of war on land it is set down as incontrovertible that the shock of grand masses should be of an exterminating character. To deny this would be to signify the return—as Clausewitz wrote: * "To the systems of warfare that preceded the Revolution and the French Empire, in which there were manifested the falsest tendencies, pretending to aggrandize the military art the more war was deprived of the use of the only means proper to it: the annihilation of the enemy's forces." Such false tendencies consisted "in the pretension of the possibility, by directly seeking only a limited destruction of the forces

* Teoria della grande guerra. Vol. I.

of the enemy, of arriving, by way of wise combinations, at his complete direct enfeeblement; or, in other words, of exercising, by means of small blows ably administered, such an influence over his will as to lead him the more promptly to submit. . . . . The direct destruction of the armed forces of the enemy must stand before every other consideration."

We observe that in affirming the possibility of having, in naval battle, to consider also the strategic situation, we have not denied the correctness of the axiom concerning annihilation; we have only expressed a reserve under the hypothesis that, after the hostile naval forces that we have confronting us, we must keep ourselves in condition to meet others of them, having at our disposal only our present forces; or under the other hypothesis that we have already confronting us the entire forces of the enemy, but we, on our part, have not a sufficient force to give us the probability of victory in a decisive battle; it may be a case of delaying the battle until the moment in which the enemy offers so vital an offense as to oblige us to stake all against all.

The comparison, then, must begin by being made with the situation of an army, A, which has confronting it a hostile army, B_1, about equal in strength; and which foresees having afterwards to fight also another army B_2. The question to be propounded is this: Does there exist for A the possibility of pushing the fight with B_1 to a finish, and of afterwards finding himself still in condition to oppose B_2? Evidently the reply may be in the affirmative; the annihilation of B_1 may bring great loss to A, which, no matter how great, may not be so important a fraction of the total as to produce incapacity to oppose B_2; the moral advantage acquired will be so great as largely to compensate for the said loss; and then, it will perhaps be possible to fill up the vacancies by drawing upon the great resources in men that modern states possess, given the national character of the wars.

At sea, under analogous conditions, the struggle against B_1—given the fact that it is victorious—*if it has been a fight to a finish,* will inevitably have caused serious losses which will either not be reparable, or will not be so in sufficient time; in other words, either we shall have lost ships, or we shall have them so seriously damaged as not to be able to count upon them when we have need of them.

The difference between the land and the sea depends essentially

upon the fact that on land it is a struggle of men; at sea it is a struggle of ships. On land, numbers constitute a great factor; at sea we have only a very limited number of units, and every elimination means the loss of an important fraction of the total.

On land, given the nature of the means, we are able to imagine only the fight to a finish or the barren struggle. The same was the case at sea during the sailing period—the condition of the means of war did not permit of efficacy except when fighting at close quarters. Under such conditions, the principle that the battle must be pushed to the annihilation of the enemy was a necessity; when the conservation of the forces was imposed, it was necessary to keep them in a potential state, just as, on land, in an analogous case, there was imposed the necessity of taking a flank position. Great admirals are not wanting to give us examples of this—it will suffice to cite some typical cases.

In 1673, Ruyter maintains himself in a state of efficiency behind the banks of Schöneveldt, because his fleet is inferior to that of the Anglo-French; in this way he conserves his forces until the time when Holland is threatened with invasion. In the war of 1778, Howe, owing to the inferiority of his forces with respect to those of d'Estaing, upon news of the arrival of the latter on the American coast, leaves the Delaware in order not to be obliged to fight under unfavorable conditions, and goes to take part in the defense of New York, in a position where the enemy does not dare to attack him. And when d'Estaing goes to support the troops of Washington in the attack on Newport, Howe goes promptly in advance to Rhode Island where, on account of the prevailing winds, he reckons upon keeping to windward, or launching fire ships if the enemy remains in the bay. The presence of Howe puts d'Estaing in a critical position, and therefore the French squadron profits by a favorable wind to leave the anchorage, thus abandoning Washington to himself. As Mahan observes, "the weaker fleet has fully beaten the stronger by virtue of its maneuvers."

To-day, the fact to be borne in mind is that long-range battle has acquired greater efficacy than in the past; and from this it follows that by keeping the development of the action within certain limits, it may be profitable to engage tactically, not only in situations analogous to those in which battle was advisable during the sailing period, but also, in part, in others in which it

was then necessary to remain in a state of efficiency. It must, then, be acknowledged that, the conduct of the forces being inspired by the postulate which we support, as against the other which expresses the necessity of engaging only under conditions of being able to seek the destruction of the enemy, we shall have an increase and not a diminution of the *offensive spirit.*

We proceed, then, to seek the solution of the proposed problem on the basis of the idea that *the strategic situation may limit the development of the tactical action, as long as we have more interest than the enemy in the conservation of the forces; while under the contrary hypothesis, it is important to press the fight to its decisive phase; which naturally does not signify that it is well to close the distance from the beginning.*

24. *Tactical Zones.*—If the problem could be solved with methods of the kind mentioned in section 22—that is, on the basis of numerical calculations—it might be possible to give to the distance of maximum utilization a strictly determined value. But the variables to be considered are such that we are not able to reach a really logical result except by dividing the tactical field into zones of considerable width, and examining, with respect to the zones, the benefits that the two opposed parties can derive from the action. At the present time the subdivision that seems reasonable is the following:

1st zone, distances from 10,000 to 8000 meters (extreme range).
2d zone, distances from 8,000 to 5000 meters (long range).
3d zone, distances from 5,000 to 3500 meters (medium range).
4th zone, distances from 3,500 to 2000 meters (close range).
5th zone, distances less than 2000 meters (close quarters).

The heavy-caliber gun is the weapon of the first two zones; therein the medium guns are of use for the improvement of the firing and for action against unprotected parts; beginning at the upper limit of the second zone these guns begin to give notably good results. In the third zone the probability of hitting with the medium guns is sufficient for assigning a special value to their action. In the fourth zone, from what has been said in Chapter II, the employment of the torpedo is possible. In the fifth zone it is also necessary to take into account the possibility of collision; its limit being assigned according to a criterion of which we shall speak in Part II.

25. *The Initial Advantage.*—A first datum concerning the relative importance to be attributed to the different zones is found

in the following axiom: It is of the highest importance to obtain an initial advantage, because it has a compound influence; that is, it tends to increase the advantage, not only by reason of the material injuries which diminish the enemy's offensive capacity, but also because it produces moral injury and disorder.* In virtue of this, as has already been realized in the Russo-Japanese war, there may be felt by the winner a relative safety which is surprising.

The initial advantage may profitably be sought, especially in the first two tactical zones, because in them full allowance may be made for exercising control over the fleet; while the further we advance into the successive zones, the more we are under the sway of the unforeseen which reigns supreme at close quarters. In other words, *it is to be held that a struggle at extreme or at long range constitutes an efficacious means of preparation for the struggle at medium or at close range.*

On the basis of the principle thus established, we may be induced to seek battle in the zones within the second by an initial disadvantage, experienced or anticipated. Let us fix the ideas in this connection.

The shorter the distance, the greater is the percentage of effective hits for both the adversaries; but may this variation be considered the same for both? Evidently, no; the difference depends upon individual ability, upon the means at one's disposal, and upon the fire control.

The difference dependent upon the gun laying varies with the firing distance; in fact, at short distances, even a mediocre gun layer fires well; the difference in ability between two gun layers always makes itself the more felt as the distance increases, and when the ship is subjected to rolling movements. So, also, the

* "D'un côté, le commandement, désepérant du succès, tombera dans l'hésitation; il songera à sauver les débris de sa fortune; la direction deviendra incertain; l'artillerie, précipitant son tir pour rattraper l'avantage, gâchera ses munitions; les officiers seront impuissants à diriger leurs hommes.

"De l'autre côté, le spectacle sera tout différent au début de l'action, le courage n'est soutenu que par une effort de la volonté qui enlève à chacun une partie de ses facultés; mais aussitôt qu'on éprouve l'impression que l'ennemi commence à céder, une détente se produit; la confiance succède à l'apprehension. Chacun reprend son sangfroid; le combat devient plus méthodique. . . . . Dès lors la victoire est assurée."—Daveluy.

greater the distance, the more the ability of the directors of the firing affects the results.

With equal ability of the personnel, the better are our range tables, the greater the homogeneity of the armaments of our ships, and the better the state of our weapons, so much the more may we have confidence in being able to adjust the firing before the enemy can do so, or, to secure the initial advantage.

But, a priori, the elements just pointed out are almost entirely imponderable; the above-mentioned differences will have effective influence, but they cannot be estimated beforehand. Generally, then, at the beginning of the combat, each of the adversaries will be confident of securing the initial advantage; consequently, *if the one who can impose the distance* (in the manner which we shall consider in Part II) *has greater interest than his adversary in the conservation of the forces* (section 23), *the action will be limited this phase; otherwise, it will consist of successive phases; but a phase in the first two zones is logically to be predicted,* except in the cases which we will now point out.

The arguments that can be deduced for maintaining that, without initial disadvantage, battle in the third and fourth zones may be expedient from the beginning, are the following:

(1) Inability to perforate the enemy's armor in the first two zones.

(2) The short life of the heavy guns.

It is to be observed that in the recent war the possibility of obtaining important tactical results, even without the effects of perforation, may have been demonstrated.

The importance of the initial advantage being admitted, given the fact that fighting at long range may serve a very useful purpose in preparing for the struggle at shorter distances, should we renounce it on account of the wear and tear to the heavy guns derived therefrom? Given the fact that we are disposed to risk the ships by closing the distance, why not also risk the guns in battle in the first two zones? The arguments adduced must be considered, but not by one of the adversaries alone; we ought not to preoccupy ourselves too much with the wear and tear of the guns, because those of the enemy are worn out equally with ours. It results from this that, while, on the one hand, in the first encounter we fight at long range, closing in afterwards according to circumstances, on the other hand, in continuing the war, we might be obliged to fight initially at medium range.

It is well, however, to hold that, having more interest than the enemy in the conservation of the forces, in order to be truly free to choose the tactical zone it is necessary that the choice be permitted by *the state of the ammunition supply and the number of guns in reserve,* which must at least be equal to that of the enemy; an inferiority in this respect evidently may render it necessary to seek to delay the battle until the strategic situation imposes a fight to a finish.

At this point in the discussion, in order to assemble the ideas concerning the interest that a belligerent may have in fighting in one zone rather than in another, let us consider the problem by parts; examining the influence of differences in the means of offense, and that of differences in the means of defense.

26. *Differences in the Means of Offense.*—Let us suppose that there exists between the adversaries a difference in the number, but equality in the kind of weapons.

If, with two opposed parties, A and B (ships or fleets), the first has over the second the advantage of n guns of a certain caliber, with equality in other conditions, the damage inflicted upon B is roughly equal to that sustained by A, increased by that which is produced by the n guns in advantage. Hence it is clear that *the difference in the number of weapons, with equality in the kinds of the same, makes its effect the more felt the more the distance diminishes;* and for this reason, unless an inferiority is so notable as to make it advisable to seek battle at close quarters, it produces an interest in fighting at long range and seeking to compensate for the disadvantage with dexterity.

Let us now suppose that A and B have guns of two kinds; for example, A has n_1 guns of heavy caliber more than B, while B has n_2 guns of medium caliber more than A. Diminishing the distance increases the efficiency of n_1 and n_2 alike; A, however, is interested in not allowing the distance to fall below the inferior limit of the zone in which the action of the heavy caliber is particularly efficacious; hence, for A, the second zone is suitable, while for B, the fourth zone is best, or the lower limit of the third, when it is desired to exclude the use of the torpedo.

In relation to the criteria just enunciated, the following observations are to be made:

(1) A ship, the guns of which are not capable of yielding the same return as those of the enemy (with equality in number and

in kind) on account of the minor dexterity of the personnel, may seem comparable to a ship less strongly armed; then, by applying the preceding criteria, this ship should be interested in fighting at long range, which would evidently be absurd. But the error lies in the comparison made; in fact, logically, the conditions of the said ship are to be compared with those of a hypothetical ship, the guns of which increase in number as the distance diminishes.

(2) Analogously to what has been said under the hypothesis of a superiority constituted exclusively by medium guns, in order to utilize to the maximum degree a superiority in heavy and medium guns, battle in the third and fourth zones would seem to be advisable. However, the importance of the initial advantage is to be taken into account, and the expediency of avoiding, as far as possible, having the superiority compromised by lucky shots. Consequently, at the beginning, long-range combat is preferable, passing afterwards to medium range, and finally to close range, in order to give the *coup de grace*. The combatant that gets the worst of it in the artillery battle, if he has not the possibility of imposing a fight at close quarters, will decide to launch torpedoes at long range. For the adversary, that might be the opportune moment for diminishing the distance and launching torpedoes without too many risks and with greater probability of success.

27. *Differences in the Means of Defense.*—On the basis of what we have noted in section 4 (Chapter I), a good distribution of 150 millimeters armor constitutes the *minimum* sufficient and necessary for the struggle at extreme range and at long range against ships armed with guns of heavy caliber. Aptitude for battle at shorter distances requires a thickness greater than the said limit, at least in the water-line belt. These criteria seem sufficient for estimating the influence that the relative conditions of protection of the adversaries may exercise upon the choice of the distance.

Ships with but little protection, but with great offensive power, may be employed against the secondary (unarmored) forces of the enemy, and also—if deemed necessary—against the principal forces, taking care to safeguard them in the manner indicated in Chapter III; in which case, however, the choice of the opportune tactical zone for the whole fleet is made independently of the presence of such ships.

Aside from this hypothesis, ships with little or no protection should avoid battle with strongly protected ships; but, when obliged to fight, they should seek to come to close range.

28. *Conclusions.*—On the basis of the preceding analysis, let us sum up for each tactical zone the conditions under which it may opportunely be selected.

Zone I is suitable for the search after the initial advantage, for the combatant that, by reason of the strategic situation, can least afford to risk his forces. It requires great organic preparation of the personnel and of the material. It is generally not capable of producing decisive effects, but is capable of accentuating differences.

To the one who desires to push the fight to its decisive phase, this zone would not be suitable when he cannot count upon a sufficient number of hours of daylight.

Battle in this zone is not possible except under the best weather conditions.

Zone II.—The combatant in the strategic situation above mentioned will pass to this zone after obtaining an initial advantage in the first zone, unless, having a greater number of heavy guns, he elects to develop the entire action in the latter. It will be the one in which, generally, the initial advantage will be sought by the combatant who desires the battle to take place in its various degrees of intensity. It is capable of decisive effects. Generally, both the adversaries will agree in desiring a prolonged phase in this zone.

Zone III is suitable for the one who obtains the advantage in the preceding zone, or who has an important superiority in medium-caliber guns, or heavy-caliber guns in bad condition.

Zone IV is generally suitable for giving the *coup de grace,* or when one has superiority in torpedo armament, or when one has ships more heavily armored than those of the enemy.

Zone V is not suitable for the one who has obtained advantage in the preceding zones. Whoever may wish to attempt a desperate stroke in order to re-establish his chances in the fight, will seek to enter this zone.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AMERICAN PRIVATEERS AT DUNKERQUE.

By Henri Malo.

Translated from the French by Stewart L. Mims.

I

In the month of February, 1778, about eight days after the signature of the treaty of the Franco-American alliance, Lamotte-Picquet, who had just cleared the coasts of Gascony and of Annis of English privateers and then cast anchor in the roads of Quiberon, fired nine salutes which awoke an echo throughout the world. It was the response to the salutes of the *Ranger,* an American privateer, commanded by Paul Jones. Since the signing of the treaty, this was the first official act of recognition by a European power of the star-spangled banner of the United Provinces of North America.[1]

Much before this date, however, during the two years that Louis XVI was hesitating to declare an inevitable war, American privateers had begun to frequent the coasts and ports of France. The French marine lost during these two years of hesitation 158 vessels, representing a value of 16,500,000 francs, which the English captured before the rupture of diplomatic relations. The pursuit of rebel privateers and of vessels suspected of carrying arms, ammunitions and money to America was the pretext seized by the English to make these captures, and to cruise along the coasts of France and to exercise patrol even in the harbors of France. In contrast with the king, the country did not hesitate to declare its opinion. It is well known with what enthusiasm Lafayette crossed the Atlantic. People in the ports gave evidence

[1] Lacour-Gayet, *La Marine militaire de la France sous le règne de Louis XVI,* Paris, 1905, p. 106.

of similar enthusiasm for the American cause. Their connivance and ofttimes that of the Admiralty as well were necessary to render possible the equipment in France of American privateers. Almost none of the American privateers which cruised in European waters were actually armed in America, most of them being armed in ports of France. The lust for gain explains, of course, the ardor of merchants to furnish arms and ammunition to the rebels, for the English government had endless trouble in preventing English merchants from carrying on the same traffic.[2] England, however, protested against the conduct of the French, which will be recounted below.

The rôle played by the American privateersmen who sailed from the ports of France has not been made known. The story has been told of some of the diplomatic incidents which their acts raised during the period of strained relations from 1775 until the declaration of war in 1778, but no one has even called attention to the rôle which they played during the war. Maclay makes no allusion to it.[3] Their activity, however, is far from being a negligible quantity and it is that which will form the subject of the present study.

Our researches have been confined for the most part to the local archives of Dunkerque.[4] In that port privateering was traditional. Its population was particularly resentful against the English, for the residence in their port of Major Frazer, an English commissioner, had been imposed upon them by a clause in the treaty of 1763 which forbade any improvements or fortification of the harbor and gave the right to the English king to maintain a commissioner at Dunkerque to assure its enforcement. Furthermore, the exceptionally strategic situation of the port and the exemption from compulsory service in the marine for sailors of all nations were advantages which were peculiarly fitted to attract the citizens of the United States who wished to carry on privateering in the waters of Europe. It was at Dunkerque, in fact, that they first appeared and became numerous.

[2] Chevalier, *Histoire de la Marine française pendant la guerre de l'Indépendance Américaine,* Paris, 1877, p. 66.

[3] Edgar Stanton Maclay, *A History of American Privateers,* London, 1900.

[4] Archives du Greffe du Tribunal de commerce, Arch. de la Ville, Arch. de la Marine.

Some idea of the importance of their activity in that port may be gained when it is stated that, after the King of France officially accorded them permission to frequent the French ports, out of a total of 150 privateers registered at the Admiralty of Dunkerque as having made cruises during the American Revolution, no less than 78 were under the command of Americans. Six of the 78 had letters of marque from Congress. All the rest sailed under the French flag and under the authority of French commissions, for the French government was not slow to recognize the serious inconveniences to be encountered in permitting privateering under foreign commissions, for French subjects could thereby escape from the jurisdiction of the French Admiralty and disregard the regulations thereof, and it accordingly forbade the practice. The total value of prizes[5] captured by privateers of Dunkerque during the American Revolution amounted to 25,000,000 francs, of which the share captured by American captains amounted to 12,500,000 francs. Among the 47 American captains who commanded these expeditions, six won such high distinction as to be recognized by the French court in investing them with the brevet of lieutenants of the king's frigates. The names of the six are Patrick Dowling, William Fall, Kenny, John Moultson, Bennet Negus and William Ripner. We shall have occasion to meet some of them in command of vessels of the division of Castagnier in the French Revolution. One of them, John Moultson, was placed in command in 1792 of the division stationed at the mouth of the Schelde.

These facts prove the importance of the study which we propose to make.

* * *

Vergennes, Minister of Foreign Affairs under Louis XVI, had not forgotten the début of the war of 1755. The first rumor of the armaments which the British Admiralty began to make found him alive to the situation. In July, 1775, he wrote,[6] "The experience of the past should put us on our guard, and we should not like to be taken for dupes a second time." On September 25 Sartine,

[5] It is a question here of the net proceeds, which were always inferior by a half to the amount of damage inflicted upon the enemy and from which, besides, 20 or 30 per cent had already been deducted for expenses.

[6] Doniol, *Histoire de la participation de la France à l'etablissement des États-Unis*, Paris, 1886, Vol. I, p. 96.

Minister of the Marine, on receiving the news that the English intended to confiscate all vessels which came from New England to Dunkerque, at once demanded explanations from the English government.[7] Almost at the same time the question arose as to the sending of arms and ammunition to America. D'Anglemont, the general commissioner of the marine at Dunkerque, received orders to prevent their expedition, but was told to employ "the greatest possible reserve in such a way that no one should know that any reserve was being made or that precautions were being taken."[8] A circular letter of November 16 repeated the defense. Sartine accompanied the circular with this commentary: "If on the one hand the government is very glad to give a proof of its good-will toward the English by impeding the traffic which Americans might carry on in our ports for the exportation of arms and ammunition, it is on the other hand equally anxious to favor commerce and place as few obstacles in its way as possible. I count too much upon your sagacity to make it necessary for me to enter into a more detailed explanation, and I have too much confidence in your intelligence not to rely upon your circumspectness in a situation which can become so delicate. You should keep the matter secret, I may add, and especially as regards what I have just said."[9] It is not surprising that shortly afterwards we find Lord Stormont, the English ambassador, demanding a renewal of the prohibition to export arms and ammunition to America. The French government acceded to his demand. Thus Sartine wrote to D'Anglemont on December 9 as follows: "His Majesty, desiring to give to the King of England a most convincing proof of his sincere friendship, has commanded me to recall to your attention the orders which I have already sent you not to permit either upon English vessels or upon those of any other nation the expedition of arms and ammunition to North America." The *armateurs* continued without difficulty their expeditions. Three weeks later Lord Stormont took the matter up again. This time he demanded that the exportation of munitions of war be prohibited *for all destination whatsoever*. Such a demand had, of course, no chance of being received favorably. Sartine replied as follows: "We cannot restrain our commerce to that degree. His

[7] Arch. Mar. Dunk., B 2, reg. 6, Letter to de Villers.
[8] *Ibid.*, 16 October, 1775.
[9] *Ibid.*, 27 November, 1775.

Majesty has already given a sufficiently striking proof of his friendship for the King of England by prohibiting the exportation of arms and ammunition to the English colonies. I am persuaded that this consideration has not escaped you." [10]

Although renewed in April and again in September the prohibition to export munitions of war to the English colonies remained ineffective.

The presence of American privateers in French ports was a subject of very warm protests by the English and on different occasions placed the cabinet of Versailles in great embarrassments. The English diplomats found clauses in the treaties upon which they based their protests. Louis XVI, although he intended to protect his own rights, intended also to respect scrupulously "the principle of fidelity to treaties."

On April 3, 1776, Congress formally authorized privateering.[11] The English at once seized upon this as a pretex to stop French vessels upon the sea [12] and to push the equipment of their vessels with more energy than ever before. Parliament was asked to pass an act which would authorize privateering for British subjects (December, 1776). The news of this fact aroused great emotion in France, for the consignments for America which were being prepared in French ports were thus placed in great danger. Vergennes wrote to Marquis d'Ossun in regard to the matter as follows: "It is an unfriendly act against the commerce of all nations, for, if one supposes that it is really only a matter of permitting privateering for the capture of American vessels, it is very easy to see that if privateersmen, who become combatants only to satisfy their desire for gain, do not find legitimate means of recovering their advance of funds, or of satisfying their avarice, they

[10] *Ibid.*, reg. 7, 4 January, 1776.

[11] Maclay, *op. cit.*, p. 132, prints the "Instructions to the Commanders of Private Ships or Vessels of War which shall have Commissions or Letters of Marque and Reprisal, authorizing them to make captures of British Vessels and Charges," and on p. 218 he reproduces a letter of marque.

[12] A Cherbourg captain was stopped at about three *lieues* to the northwest of Ouessant by an English vessel which demanded him to tell the news of what was taking place at Brest and Rochefort. The captain replied that he knew nothing. The English officer remarked in quitting him that he was in search of vessels from New England (Arch. Mar. Dunk., B 2, reg. 7). It became the habit shortly afterwards for the English officer to take such a French vessel captive.

will become very ingenious in creating pretexts to disturb the commerce of other nations, and will never be lacking in excuses to pillage and retain vessels which have rich cargoes to tempt them." To Marquis de Noailles he wrote: "The king and his council regard the bill as an act of desperation which will undoubtedly disturb the commerce of other nations—I shall say this to Lord Stormont—and I shall not conceal from him that if the bill were to be passed by parliament, we should be placed in the necessity to take measures to protect our trade from the greed of English privateersmen." [13] The English ambassador offered an explanation by saying that "it was not proposed in the bill to arm privateers properly speaking. Authorization would be given simply to merchant vessels to capture and hold for their own count American vessels captured by them. Ordinarily the proceeds from prizes were divided between the king and the Admiralty." [14] This reply was a check for the French, whose protests remained without avail.

While the diplomats had been exchanging notes, incidents were being multiplied. In February, 1777, an English vessel of 70 guns was cruising in the Gulf of Gascony to capture American vessels trading in French ports. Count de Grasse, in command of *L'Intrépide,* a vessel armed with 74 guns and accompanied by a frigate, was detailed to this coast to protect foreign vessels pursued by the English which claimed his protection. He was ordered to employ force in case the English persisted in their pursuit.[15] In the following year the same mission was entrusted to Lamotte-Picquet. In the spring of 1777 a sensation was created at Dunkerque. On April 17 the *Admiral Pocock,* a lugger of English construction, was anchored at the quay of the port. Its captain, Robert Murdock, sold it for the price of 500 louis d'or (12,000 livres) to an American, Beach by name, who made the purchase for the account of one of his countrymen, Gustavus Cunningham, a captain in the service of the United States.[16] The preceding year (June, 1776) Cunningham, in command of the sloop *Lady Washington,* had been attacked in American waters by four armed barges from British war-ships. The English had

[13] Doniol, *op. cit.,* II, p. 79, fol. 13 and 14 December, 1776.
[14] *Ibid.,* p. 130.
[15] Lacour-Gayet, *op. cit.,* pp. 87-88.
[16] Arch. Greffe Trib. Com. Dunk.

many killed and were defeated. In October he was again cruising off Boston when he captured a ship with a rich cargo of rum, sugar and cotton.[17] Once in possession of the *Admiral Pocock,* Cunningham rebaptised her with the name *Surprise,* and then with Beach as his second and a letter of marque of Congress in his pocket, he set sail under the disguise of a bona-fide smuggler. On the morrow he threw off his mask, hoisted the American flag and began to cruise at the mouth of the Meuse. On May 2 he captured in succession the packet *Prince of Orange,* en route from Harwick to Hellevoetsluis, and the 110-ton brig *Joseph,* en route from Messina to Hamburg with a cargo of wine, lemons and oranges. He placed the crew and passengers of the packets, together with their jewelry and personal effects, aboard a Dutch fishing vessel, and the crew of the brig aboard another fishing vessel bound for Nieuport. Cunningham then made way for Dunkerque with his two prizes. When he arrived there, two English ketches fouled him intentionally in order to damage his vessel. As a result his ship sprang a leak.

Cunningham presented himself in haste at the Admiralty bureau to make his declaration and to claim an inspection of his vessels. It was of importance to proceed with haste to the determination of the damages which his vessel had suffered, because he ran the risk of forfeiting after the lapse of 24 hours, his two prizes. Book 3, Art. 14, title 9 of the ordinance of the marine read: "No vessel captured by captains under a foreign commission can remain more than 24 hours within our ports and harbors unless retained by stress of weather or unless the capture has been made upon our enemies." Official inspection was made on May 9, and the verbal process, establishing the damages caused to the three vessels, was dressed and granted to the privateer the right of repairs and the permission to dispose of her two prizes.

In the meantime the captain of the *Joseph* had filed protest with the British consul at Ostend and a diplomatic correspondence had begun in regard to the matter. Sartine addressed an order to D'Anglemont on May 8 to arrest Cunningham, Beach and their crew, to hold their vessel captive and to release the two prizes. Sartine complained of the fact that his subordinates had failed to notify him of what had taken place. The captain and crew of the

[17] Maclay, *op. cit.*, p. 72.

Surprise were imprisoned, seals put upon her and a guard placed aboard.

Andrew Frazer, the British commissioner at Dunkerque, grew impatient at the delay in the surrender of the two prizes and complained of it to Lord Stormont. A letter was addressed by the latter to Vergennes on the subject. Vergennes replied on May 22 as follows: "If the commissioner had been willing to take charge of the prizes, no delay would have been occasioned in their surrender. It was upon his refusal that M. de Villers consigned them, together with their captors, to the Admiralty, although M. de Sartine in his first instructions gave orders that they be surrendered whenever a qualified claimant appeared. He is going to repeat the order and I hope that there will be no occasion for further delay." Sartine had in fact written on May 20 and 22. It was not until June 16 that he gave orders to release immediately Cunningham and his crew. Cunningham then demanded the breaking of the seals imposed on his vessel.

In order to avoid the rise of similar cases, Sartine made many recommendations. On May 8, after having suspected that a small vessel was being equipped at Dunkerque as a privateer, he wrote to D'Anglemont to investigate the matter and to prevent any such affair. On the 17th he learned that some vessels were being laden with cargoes of merchandise and munitions of war and that some Americans were to be taken aboard as passengers who, once upon the sea, would take command and, by the authority of letters of marque of Congress, would try to capture any English vessels encountered. The king refused to permit such expeditions. D'Anglemont was ordered to make an investigation by making necessary searches, "but with due prudence." On the 29th de Villers received the following letter:

I am informed, Sir, that it is being planned at Dunkerque to fit out as privateers two cutters lately arrived from England, and that when ready they are to cruise under a commission of the American Congress for the capture of English vessels. I am assured even that these two cutters arrived in the port without a cannon and have actually at present 16 or 18. You should know that it is not His Majesty's intention to authorize any such armaments or to permit any one to equip in his ports vessels for war. You should by all proper means attempt to find out if two such cutters are being armed at Dunkerque and, in case that you become convinced of the fact, you are to refuse permission for them to sail. You are aware of what harm such armaments can cause to the tranquillity of trade at Dunkerque. They are infractions upon our treaties and are an injury

to the welfare of the port. You will take the trouble to inform me exactly, even to the most minute detail, of all which you can learn of any such armaments, and you will take all pains to check from the very beginning anything which might prove a violation of our treaties and of the intentions of the king.[18]

On June 8 the minister admitted that one could not prevent one of the cutters in question to sail from the port as an ordinary smuggler, but that on the other hand it could not be allowed to sail under the American flag. The cutter was being laden, so it was said, by one William Hodge for Ireland, but with a large cargo of ammunition. The two cutters were the *Surprise* and the *Revenge*. Seventeen sailors were being enrolled at Calais for the former, when Sartine wrote "if it were such a good sailor the king would buy it." The minister renewed his orders to prevent either of the vessels to sail. Whereupon the *Surprise* was sold by an Irishman to Dominique Morel, a widow, and the *Revenge* to Richard Allen, an Englishman. The Admiralty of Dunkerque considered the sale of the former suspicious, but raised no objections to that of the latter. Permission to sail was refused to the *Surprise,* but accorded to the *Revenge,* whose destination, according to its passport, was Bergen in Norway. "An assurance and bond that this vessel would not be used as a privateer and would not take any Frenchmen aboard" were demanded of both the buyer and seller.[19]

The *Revenge* was no sooner upon the sea than Cunningham took command. He attacked and captured several English vessels. One of them, with apparently the richest cargo, was rescued from its captors. Out of 21 who had been placed aboard this prize to man her, no less than 16 were Frenchmen. Much later Cunningham pretended that once upon the sea he found aboard his vessel a large number of volunteers who had been enlisted by Webb and not by him, and who had been embarked at night in order to escape the inspection of the commissioner of enlistments, who would have refused them permission to embark. Many of these volunteers had never been upon the sea before and were consequently in the way and consumed rations without rendering any service. He got rid of them by placing them aboard the aforesaid prize, which fell into the hands of the English. Three years later

[18] Arch. Mar. Dunk., B 2, reg. 7.
[19] Doniol, *op. cit.,* II, 497.

these volunteers were still in prison in England. Cunningham also asserted emphatically that "no person whatever at Dunkerque had a share in his armament either directly or indirectly."[20]

During the first days of September a Flemish dogger on its return from Iceland encountered Cunningham, who committed into his hands a package of letters and two valises. He appeared to be making for some port of France with two prizes in tow. The minister on being informed of the Flemish captain's declaration, immediately gave orders to arrest the American captain in case he returned to the coasts of France; but Cunningham, undoubtedly fearing such a thing, went to Bilbao, where he met Hodge. No further news was had of him in France before 1781, when he was summoned to appear before the commissioner of enlistments, who demanded a regulation of the shares in the prizes due to the volunteers who had served under him and who were still in prison.

The English ministers did not cease to make protests. They were shrewd enough to justify their own preparations by intimidating the French in regard to theirs. Lord Weymouth complained that Americans were making frequent armaments in French ports. Vergennes replied that it was impossible to prevent the sailing of vessels which dissimulated their real destination. "The court of London," he remarked, "is encountering the same experience every day." In the nature of things it was impossible to be informed promptly of such armaments. "It is all the more natural," he added, "that Viscount Stormont should be informed before us and that his information should be more exact than ours, for he has spies in all of our ports. The maintenance of these spies is a bit of strange conduct, even a lack of proper consideration for our feelings, and we should be justified in protesting against it, if we had an interest in concealing what is being done in our ports." In the presence of the vexations caused by English privateers, French vessels were forced to arm themselves, and nothing could keep them from it.[21]

Vergennes was probably better informed than he admitted to the English, for his colleague, Sartine, wrote to de Villers that the arrival and sojourn of American privateers in French ports

[20] Arch. Greffe Trib. Com. Dunk., Rapports de guerre 1779-1782, f. 167 v°.
[21] Doniol, *op. cit.*, II, 505, 21 June, 1777.

hindered trade, for their principal object was to find English vessels anchored in French ports and to seize the chance to capture them at their sailing. As such conduct was contrary to treaties, he ordered de Villers to notify the said privateers that they could no longer remain at Dunkerque. De Villers was also ordered to pass in review the crews of the privateersmen, in order to find French sailors, and not to suffer prizes to remain in the port beyond the time prescribed by the ordinances, and finally to warn the privateersmen that if they returned to French ports they would be disarmed.[22]

Upon their arrival in Europe, the commissioners of Congress, Benjamin Franklin and Silas Deane, saw at once how important it was for the triumph of the American cause to attack the English in their most vital spot, namely, their commerce. Cunningham had already begun his cruise as a privateersman when Franklin wrote from Paris, May 26, 1777, to the Committee on Foreign Affairs as follows: "I have not the least doubt but that two or three of the Continental frigates sent into the German Ocean, with some less swift-sailing craft, might intercept and seize a great part of the Baltic and Northern trade. One frigate would be sufficient to destroy the whole of the Greenland fisheries and take the Hudson Bay ships returning."[23] These suggestions were promptly acted upon. Not having frigates available, the Marine Committee sent two cruisers, *Reprisal* and *Lexington,* which were joined in June by the 10-gun cutter *Dolphin.* These three vessels made the complete circuit of Ireland twice and captured 16 prizes, which they brought and sold in French ports. The proceeds thus realized furnished to the commissioners useful funds with which to plead their cause in European courts.

As soon as he learned of these facts, Vergennes addressed to Franklin and his colleagues an official note entitled "Notification given to the commissioners of the United States of the prescriptions which have been addressed to the officers of the Admiralty and to the Chambers of Commerce in regard to privateering." The text of the note is as follows:

Sirs, You cannot forget that in the first conversation which I had with each of you I assured you that you would find in France both a respect for your persons and all the security and facilities of residence which are guar-

[22] Arch. Mar. Dunk., B 2, reg. 7, 10 July, 1777.
[23] Maclay, *op. cit.,* p. xi.

anteed to foreigners, and that, as to commerce and navigation, we should accord you all the freedom which was compatible with an exact observance of our treaties with England, which the king is obliged by principle to respect scrupulously. In order to avoid all manner of doubt concerning the vessels which might enjoy the privileges granted in our ports to friendly nations, I called your attention to the article of the treaty which forbids us, except in cases of emergency, to grant to privateers free access to our ports and the privilege of deposing and selling their prizes. You promised me, Sirs, to conduct yourselves in accordance with this law. After an explanation of such precision, we insisted on the departure of the *Reprisal,* the vessel which had brought Mr. Franklin to France, because we learned that it was planning to sail with a cargo of merchandise. We had completely lost sight of this vessel and supposed that it was in American waters, when to our great surprise we learned that it had entered the port of Lorient after having made several captures at sea. Orders were immediately given to compel it to sail within twenty-four hours and to place its prizes in the hands of the Admiralty officers, who alone were competent to pass judgment on the validity of their capture. Captain Wickes complained of leaks in his vessel. After an official inspection, permission was granted him to make repairs. He was commanded to sail after this was done.

After repeated warnings of this nature, prompted by motives which you should understand, we had no reason to expect that M. Wickes would continue to cruise in European waters, and we could only be very much surprised, indeed, to learn that after having joined force with two other armed vessels, the *Lexington* and the *Dolphin,* to cruise along the shores of England, he returned with these two vessels to seek refuge in our ports. You are too well-informed, Sirs, and too sharp-witted not to know to what point such conduct wounds the dignity of the king, my master, and at the same time to understand how inconsistent it is with the principles of neutrality which His Majesty professes to respect. I shall expect, consequently, that from a spirit of justice you will be the first to condemn conduct which is so contrary to the laws of hospitality and of propriety. The king does not wish to be misunderstood, and it is by his own command that I inform you, Sirs, that orders have been sent to the ports where the aforesaid vessels have anchored to seize them and detain them until sufficient guaranties have been obtained that they will return immediately to their home ports and not run further risks, by new acts of hostility, of being forced to seek refuge in our ports. In regard to any prizes which they may have brought with them, orders have been given to force them to sail immediately. The same conduct will be observed in regard to all captures of all nations whatsoever. Such are the obligations of our treaties, which are also in harmony with our maritime regulations and which the king cannot in any way fail to respect. It would be highly proper for you to make known these intentions of the king, wherever you judge it most useful to do so, in order that other vessels armed for the same purpose may not follow the example of the above-named, and thus expose themselves in their turn to the same embarrassments. (Signed) de Vergennes.

In their reply to this letter, which was written on the morrow, the American commissioners said:

> It is for us a cause of much vexation that a vessel of war belonging to our country, either by ignorance or by inadvertence, has offended even in the smallest measure His Majesty. The captains Wickes, Nicholson and Johnson have explained to us their return to France by saying that they were chased in the channel and blockaded in our ports by English men-of-war, which we have no reason to doubt as the *Reprisal* in particular was forced to throw its cannon overboard in order to facilitate its escape . . . . We shall communicate the orders of His Majesty to our friends who are in French ports, and we shall inform Congress of them, in order that our vessels of war may be warned of the consequences which will result from an infraction of these orders.[24]

Lord Stormont had already on the 18th made quite a scene in his interview with de Vergennes in regard to the matter. Although Vergennes admitted that the conduct of the American privateersmen was intolerable, he refused to accept the demands of the English ambassador for a restitution of the prizes, on the formal plea that there were no grounds on which such a procedure could be made. As to any other action against the captors, "I hope," he remarked to Marquis de Noailles, "that too much wisdom will be shown to make a similar proposal."[25]

The affair of the *Revenge* caused much more disturbance in England than that of the others. The fact that French sailors were found among its crew "made the English ministers cry out aloud." The cabinet of St. James became persuaded that there was connivance between the cabinet of Versailles and the American commissioners. "Very far from the existence of such a thing," so Vergennes wrote to d'Ossun, "the king, who has been very much offended by these procedures, has ordered the lieutenant of his Admiralty at Dunkerque to give an account of his conduct, which is so diametrically opposed to the orders which he has received, and he has ordered the arrest of the buyer and seller, both of whom gave bond that the vessel would not be used for the purpose of privateering. The seller, Sir Hodge, is already prisoner in the Bastille. We are awaiting news from Dunkerque as to the arrest of the buyer. Such is the true state of this affair which seems to stir up such violent resentment in England, the consequences of which I am as yet unable to foresee. The fear of a

[24] Doniol, *op. cit.*, II, 520.
[25] *Ibid.*, p. 514, 19 July, 1777.

disturbance may have caused the Admiralty to permit the privateer to sail—or it may be that the Admiralty is not responsible at all for the embarkment of the French sailors who were found aboard the recaptured prize. Sailors enjoy great liberty at Dunkerque, the harbor and coast are not patrolled and nothing is so easy as to embark sailors on a vessel under sail outside the port." [26]

The French ministers did their best to prevent the occurrence of facts which would justify English complaints, but the sharp practices employed by the *armateurs* to conceal the real destination of their vessels could be detected only with much difficulty. In the month of August, 1777, a cutter, *L'Expédition,* was being armed at Dunkerque evidently as a privateer, but it was impossible for Sartine to determine against whom it was to be directed. He finally gave orders to prevent it from sailing in any case. " whether it be a vessel equipped by some Americans against the English or by some English against the Americans." [27]

However great may have been the irritation of the English, it was no less great among the French, and the government attempted to calm it among the people. " You will see, Sir,[28] by the inclosed copy of a letter from M. de Guichard, late commander at Dunkerque, the excess of English insolence. We have judged it prudent to conceal our resentment and have contented ourselves with sending a frigate and a corvette to insure police patrol in the road." The English had sent some of their ships there much before. As early as May 12, André Marin, a coasting pilot, who had been sent by the orders of his superiors to pilot an English brigantine with a cargo of coal, decided to enter in the port (of Dunkerque). In the road, near the harbor buoys, were anchored two vessels of the British royal marine. Both of them fired shots at the brigantine, which was obliged to lay to and submit to an inspection of its papers. On the 26th, the Admiralty officers noted that the vessel of the King of England, *The Ranger,* Captain Vernon Gates, " the same which had fired on an English vessel entering in port on 12th inst.," had returned and an-

[26] *Ibid.,* pp. 497-498 and note; Vergennes to d'Ossun.

[27] Arch. Mar. Dunk., B 2, reg. 7, 18 August, 1777.

[28] *Ibid.,* and Chambre de Commerce, Reg. Délibérations XLI, f. 122 and 129.

chored at the same place.[29] This practice was continued uninterruptedly. In July the *Speedwell* and the cutter *Wils*, both of the royal navy, cast anchor in the road with the design of intercepting and of burning, if possible, the cutter *LeLévrier*. The strongest cutter in the British marine was scheduled to come and join them. Two English officers, one a lieutenant from the *Speedwell* and the other a lieutenant from the *Wils*, were bold enough to come ashore, under the pretext of seeking provisions, in order to obtain information in regard to the vessel which they were lying in wait for. But they were no more able than the officers of the king to prevent *Le Lévrier* from sailing. Once upon the sea that vessel took the name of *Revenge* and began under the orders of Cunningham to cruise as we have already recounted.

It was at this time that the French government sent to Dunkerque the corvette *l'Étourdie*, commanded by the Chevalier Bernard de Marigny, and the frigate *La Danaé*, Captain de Kergarion, which was replaced on October 30 by *le Zéphir*, Captain de Bavre.[30] At the same time, however, the king, Louis XVI, charged Sartine to notify the Chamber of Commerce that he was firmly determined to respect "the principle of fidelity to treaties." He renewed the orders not to permit prizes and foreign privateers to remain in the ports of the realm longer than the time regarded as absolutely necessary to insure their safety. The king was very well aware of the tricks resorted to by traders in order to obtain the merchandise in the cargoes of prizes, such as false contracts, changing the name of vessels, disguising and changing the destination of cargoes, etc. He therefore ordered that nothing be bought from the cargoes of such prizes either directly or indirectly. Orders were given to prosecute any infractions of this regulation.

The English profited from these measures to capture as many French vessels as possible. We have already indicated the above proportions which their captures attained. This time it was the cabinet of Versailles which complained with the greatest vivacity. The English government replied by promising the creation of a special commission to judge the appeals from such confiscations. French *armateurs* had only to address their complaints by procuration (31st October, 1777).[31] Almost at the same time the

[29] Doniol, *op. cit.*, p. 497, Vergennes to d'Ossun, July, 1777.
[30] Arch. Greffe Trib. Com.
[31] Chambre de Commerce, Reg. Délib. XLI, f. 146.

armateurs of Dunkerque learned that one of their vessels, *L'Aimable Reine,* had just been captured by the English on its return from Martinique.[32]

At the commencement of the year 1778, events began to take place with great rapidity. France and the United States signed a treaty of alliance. Marquis de Noailles and Lord Stormont were recalled by their respective governments. The Admiralty officers of Dunkerque hastened to inquire as to the conduct which they should maintain in the future in regard to American privateers. The reply was made that " in conformity with the treaty of commerce and friendship, which had been made with the United States of North America there could (can) be no difficulty in receiving these vessels in our ports and that the intention of His Majesty was (is) that they be treated with the greatest favor." [33]

Thus Louis XVI had finally authorized his subjects to arm privateers against the vessels of His Britannic Majesty. He published " A regulation concerning the prizes which French privateers conduct into the ports of the United States of America and those which American privateers conduct into the ports of France." The clauses of this regulation provided exactly reciprocal advantages. Thus the privateersmen of each nation were to enjoy the privilege of conducting their prizes into the ports of the other; formalities were prescribed which should be observed in regard to the length of sojourn, to the sale of perishable merchandise, to the final disposition of prizes, to the expedition of papers of procedure to the general secretary of the marine, to special cases of liquidation, and finally to the surrender of prisoners who had been guarded and nourished at the expense of the government whose subjects had made the capture.[34]

A mutual understanding and aid were henceforth complete and effective between the two countries. That is why we fail to find after this date further American armaments at Dunkerque, but instead many French armaments confided to American captains whose brilliant work we are to see in the following pages.

[32] Letter from Capt. Berthelot from New York, November 7.
[33] Arch. Mar. Dunk., B 2, reg. 8.
[34] Arch. Ville Dunk., 201.

II

The American captains were followed to Dunkerque by a large number of sailors from their own country. Their crews were composed, as was the custom among corsairs, of men of all nations, but their compatriots were in a large majority.

It resulted from this that, although most of them adopted the current practices of privateering in their contracts for armament and other matters, about a third of them enlisted under varying contracts which differed from the ordinary.

Ordinarily the *armateur* and investors bore the expenses of the equipment of vessels, of necessary advances of money, of repairs, of disarming the *privateers*. The crews received monthly wages. The sums gained from the sale of prizes and ransoms were divided in thirds, two thirds going to the *armateur* and investors and one third to the crew. The *armateur* received in addition a commission which amounted ordinarily to 2½ per cent on all negotiations.

Another form of contract, which was called "contract of freebooters," was as follows: All expenses were shared in common by the *armateur,* investors and crew, the total of which was deducted from the sums gained by the sale and ransom of prizes. The profit was then divided into two equal portions, one for the *armateur* and investors, the other for the crew, who received no monthly wages. The amount yielded by the sale of the vessel employed in such an expedition and sold at its completion was counted in the total to be divided.

The contracts are in two languages arranged in parallel columns. The *armateur* signed the French text and the sailors the English text. The following is a typical example.

Engagement of the crew of the lugger, *Fleur-de-Mai,* armed by M. Aget and commanded by Patrick Dowling, Esq., under the commission S. A. S., Mgr. l'Amiral for a privateering expedition of six weeks against the enemies of the State.

We hereby by these presents engage ourselves to six weeks of effective service on the sea aboard the good lugger, *Fleur-de-Mai,* mounting two guns and 14 swivels and ordinary firearms, armed in this port of Dunkerque by M. Aget, *armateur,* under the commission in war of S. A. S., Mgr. le Grand Amiral de France, under the command of Patrick Dowling, Esq., to give chase to, to capture, to hold in ransom and to destroy whatever vessels possible which are the property of the enemies of His Majesty, the King of France.

We hereby promise to be faithful to our oath of alliance to the King of France in our quality of citizens of the United States of North America,

and to fight against the subjects of the King of Great Britain and of Ireland, to obey the orders of the aforesaid Capt. Patrick Dowling, each in his capacity specified and regalated in the roll of the crew which will have been made by the commissioner of the marine in this port.

We agree and promise to make the aforesaid cruise of six weeks entire upon the sea, without counting the time which we shall pass in roads and harbors for whatever reasons that may be and to do our best to render this cruise as profitable as possible to all parties interested.

We agree and recognize that the above armament is made under the form and denomination of contract of freebooters, by which after deduction shall have been made for the total amount expended for the purchase and armament of the vessel, the outlay of funds, we shall receive one-half of the sum yielded by the sale of prizes, ransoms and captures whatsoever.

Likewise all expenses occasioned by the disposition of prizes, ransoms and captures, as also those which our vessel may incur, which should be paid, half by the investors and half from the net sum realized from prizes and ransoms which we shall have made, shall be divided equally between the owner of the vessel and the captain, officers, sailors and others of the crew. As for our half, it is to be divided among the crew as specified below.

After the cruise shall have been finished, the aforesaid lugger shall be sold and the proceeds divided as stated above.

We hereby promise also to pay and reimburse M. Aget for the loans of money which he may have made us to satisfy our needs. The said payment is to be made from our individual shares in the proceeds of the first captures made by us, because according to the terms of this agreement we are to receive no wages and can under no consideration make any claims thereto.

Made under our signatures at Dunkerque, this the 19th day of May, 1780.

The tonnage of the vessels confided to American captains varied from 10 to 300 tons. We do not take into consideration the small vessels of 3 tons and even less which were the object of impromptu armaments in order to attempt some sudden adventure. The number of men in the crews varied proportionally from 10 to 220. Inasmuch as they did not know these captains lately arrived in the port, the *armateurs* at first confided only small vessels to their command, thus risking only small capital, but very shortly they did not hesitate to increase the importance of the armaments and to entrust them into the hands of those who gave proof of courage and skill.

The lugger *Serpent*, for instance, under the command of Jonathan Arnold, gauging 30 tons, was manned by a crew of 11 men and armed only with common firearms. Cruising during a bit of bad weather off The Downs, Arnold placed most of his crew in a large row-boat, which he sent toward the shore in order to surprise

some vessel. The community of language made the attempt much easier. But the boat struck a rock and filled with water. The crew gained the shore. Arnold being thus abandoned regained Dunkerque in his sloop with only one of his men aboard (30th May, 1782). No other *armateur* was willing to confide a vessel to him after this experience.[35]

Defective armaments were rare. We have found almost none except that of *Le Petit Commandant,* Captain William Ripner, which was unable to carry four of its guns, because they were found to be too feeble and too long, and his skiff, because it was too long.

A specimen of a strongly armed vessel is *La Marquise de Castries,* placed under the command of William Fall, lieutenant of the frigate of the king (November, 1782-January, 1783). This vessel was a brigantine, a clinker-built vessel of Boulogne and previously called *La Princesse Noire,* of 300 tons, mounting twenty-two 9-pounders, two 6-pounders, four 12-pound howitzers, six swivels, 109 ordinary guns, 25 blunderbusses mounted on iron-crutches, 81 sabres, 61 pistols and 99 grappling-hooks.

It had a crew of 163 men and was equipped by Poreau, an *armateur.* The items of expense of the equipment of this vessel were as follows:

	liv.	s.	d.
Purchase of the vessel	65,000	0	0
Repairs	72,517	11	4
Lodging	36,339	8	10
Sums advanced	49,490	0	0
Sundries	3,188	5	6
Idem	683	12	0
Provisions	24,850	18	1
Outlays	2,650	2	9
Total	254,719	18	6

Armaments of this nature were much more expensive, but they yielded the greatest profits. The smaller armaments proved, as a general rule, less effective to such a degree that the government forbade the enlistment of regularly enlisted sailors in their crews in order to prevent, so to speak, a benevolent surrender of them to the enemy.

[35] Arch. Greffe, Rap. de guerre, f. 6.

We have said that the net product of prizes made by Americans amounted to a total of 12,500,000 livres. Among the captains who had the largest shares in this total were the following:

	liv.	s.	d.
Thomas Maccatter	1,820,280	0	1
John Moultson	1,397,890	1	4
Bennett Negus	1,539,035	12	0
Patrick Dowling	1,535,657	1	8
John Kelly	889,784	11	4
William Fall	793,669	5	3
Luke Ryan	675,521	13	5
Richard Boorn	569,597	14	3
William Ripner	463,816	7	8

Twenty-five of them finished their cruises without capturing any prizes. Twenty were made prisoners by the enemy, of whom two were rescued by their crews. The report made by Captain John Smith tells how he effected the rescue of his vessel, *Resolution,* which was small, having a crew of only 13 men, and armed with simple firearms. It had been armed at Calais by Gamba and Archdeacon. Having sailed on February 27, 1781, he was chased during four hours on March 3, near Harwich, by an English revenue cutter, which overtook him near Northforeland and forced him to run down his colors. The revenue cutter was armed with four 6-pound and two 4-pound guns and 10 swivels, and had a crew of 18. The captain forced Smith and his crew to come aboard his ship, and he placed a crew of his own men aboard the *Resolution.* Smith, soon afterwards noticing that his captor was not on his guard, passed the word to his own men. All agreed to make the attempt to capture the vessel, which they succeeded in doing. They then recaptured their own vessel. In the action, Smith lost his letters of marque and other papers and did not notice (at least he so affirms) that the crew of the cutter escaped to the coast in their skiff. He re-entered triumphantly at Dunkerque with his vessel and prize, *Swift* by name, which had a cargo of gin and tea and yielded 26,413 liv. 14 s. 10 d.[36]

The proportion of corsairs captured by the enemy is relatively great. The captains for the most part offered very little resistance when they encountered much superior force. At the first summons they surrendered. There are 16 who on the contrary never hesitated to fight bravely and even to court great risks. It

[36] *Ibid.*, f. 153, v°.

is interesting to note that, with about one exception, which was due to particular circumstances, it was their cruises which yielded the largest profits.

The *armateurs*, like all brokers, attempted to attract investors by proposing an affair under the most seductive aspects. Thus they sent an enticing prospectus to persons who were likely to take shares in their armament. A prospectus of this nature signed by Gaspard Morel is valuable from the fact that it enables us to see the innovations introduced by the Americans in the equipment of privateers, for it makes special mention of these innovations as being advantageous and economical (25th July, 1780). An extract from it is as follows:

> The war in which the Americans are engaged against their métropole has forced them to seek the means of resisting English forces by armaments which would not be expensive, but which would be capable of rendering their vessels formidable to the enemy either by superior speed in sailing or by the protection of a strong artillery capable of being utilized advantageously. They have devised the construction of pilot boats, which is recognized to offer great advantages and which will be employed in the expedition which is being planned for the near future. Instead of equipping the privateer[37] after the European manner with twelve or fourteen 3-pound guns, it will be armed with five 6-pounders and five 1-pound swivels, which can be put in action from either side of the vessel and with a rapidity twice as great as cannon mounted in the accustomed way. For this reason the five 6-pound guns will do the work of ten. In addition to this remarkable advantage, the crew will remain invisible. This fortunate provision offers security to the sailors, which, united to other advantages which have been tested by experience, justifies the greatest hopes of success.[38]

The first *armateur* of Dunkerque who employed Americans as corsairs and hastened to profit from the fact that they were foreigners was Sir Jean Torris. As early as October 6, 1779, he had drawn up a "contract for the armament of foreign vessels." Among the signatures of the interested parties are to be found those of three American captains who made themselves well-known during the course of the war. The crews of the two vessels, mentioned in this contract, were to be composed of American and Irish sailors. Torris had previously demanded from the government the authorization to enlist about thirty among the

[37] It was the *Jeune Dunkerquoise*, 66 ft. keel, 65 ft. overall, 18 ft. abeam, 9 ft. draught, with a complement of 60 men, estimated value 600,000 livres.

[38] Arch. Ville Dunk., 205.

prisoners taken on board English vessels. Permission was accorded to do so only so far as Americans were concerned. At first he did not find a sufficient number. As for the Irish, "the six who propose to return to England aboard a vessel which they had bought, prove that one can count upon their fidelity." Besides the minister was unwilling to diminish the number of prisoners which could serve for exchange.[39] He had other motives for interference in the affairs of Sir Torris. The text of the contract shows this at the first glance. It is as follows:

Contract for the Armament of Foreign Vessels

Two American cutters, the *Black Prince,* mounting sixteen 3- and 4-pound guns and 32 swivels, under the command of Capt. Patrick Dowling and the *Black Princess,* armed with eighteen 2-, 3- and 4-pound guns, and 24 swivels, under the command of Edward Maccatter, both at present at Dunkerque with a commission of the Congress of the Thirteen United Provinces of North America for a cruise of three months' duration against the enemies of the aforesaid United States, which they are to pursue in partnership, the crews having agreed that they will divide the proceeds of all prizes and ransoms whatsoever, whether made by the vessels acting together or separately throughout the entire cruise.

Jean Torris, Esq., merchant in this city of Dunkerque, the sole *armateur* having charge of the affairs of the two cutters, the *Black Prince* and *Black Princess,* shall alone be charged with the plans of campaign for the cruise, of the disposition of prizes and ransoms, of sales and all other matters pertaining thereto. It shall be permitted to him to take whatever measures he likes in the discharge of these duties, without being obliged in any way to consult the undersigned interested parties. He shall not recognize as interested parties others than those who have signed the present contract. He may send prizes from the ports where they may have been brought to any other port either of this kingdom, or of Spain, or of any other neutral power which he may judge proper and advantageous to the armament. He may also insure, if he thinks it necessary, the armament either for its entire value or for a part thereof against all risks. Finally he may take whatever measures he chooses in regard to this armament without being compelled to seek any other authorization than that which is hereby given him by the undersigned interested parties.

These two cutters, such as they are, after being armed and made ready to be put upon the sea, together with the sum necessary to equip them with crews, cannon, provisions for three months, according to the inventory of each which will have been attached to the present regulation at the time of sailing, will be valued at 150,000 livres tournois, all commissions and expenditures whatsoever included.

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[39] Arch. Mar. Dunk., B 2, reg. 9. Letters from Sartine to D'Anglemont, 14 October, 16 Nov., 1779.

The undersigned by these presents declare themselves satisfied with this appreciation of the total value of the armament of the two cutters and promise to pay at time of the signature of this document the sum subscribed of the 150,000 livres by each. The *armateur* will thus be compelled to furnish no account of the armament, and the undersigned declare themselves contented with the inventories of the state of the two cutters at the moment of their departure.

Shares will be issued for sums of one, two, three thousand livres and more. No share shall be for less than 1,000 livres tournois.

Each of the undersigned will contribute proportionately to the expenses incurred by repairs and disarmament. It will be permitted to Sir Jean Torris to make a second armament after the first cruise is finished, if circumstances are propitious, and to utilize for this purpose the proceeds of the first cruise and even, in case that such proceeds prove insufficient, he may demand of each share-holder a sum in proportion to the amount of his stock. He shall be forced to justify such a demand by rendering an account which will prove its necessity.

The undersigned furthermore agree to allow to Sir Jean Torris in compensation for the toil and labor required in the general direction of this affair, which is of a peculiar nature, a commission of 3 per cent on the total amount of the proceeds from prizes, ransoms and other sources whatsoever, whether the negotiations be made at Dunkerque or in other ports where correspondents may be allowed other commissions or where extraordinary expenditures may be necessary. Likewise a commission of 3 per cent is accorded to the said *armateur* on the amounts of all expenditures and costs of repairs made during the entire cruise.

The undersigned hereby declare that, in accordance with the terms of this contract for an armament of special character, they renounce the benefits guaranteed by all ordinances and regulations of the marine which are contrary to the said contract, and they guarantee to the said Sir Jean Torris the enjoyment of all the benefits herein provided.

The *armateur* promises and hereby pledges himself to liquidate and divide among the undersigned the proceeds, as soon as the prizes shall have been sold and all returns made, after the cruise is terminated.

The undersigned agree to follow in respect to this armament the regulation, laws, etc., of the Congress of the United States of America governing privateering, and to accord to the crews the half of all proceeds from prizes, ransoms and other profits resulting from the cruise, after deduction has been made for the aforesaid cost of armament and in conformity to the way which was followed for the first cruise of the *Black Prince*.

Made in good faith at Dunkerque, the sixth day of October, 1779. Agreed for 1 1/16 interest, Pat. Dowling (signed); for 1/12 interest, J. Torris (signed); for 1/12 interest, Edward Wildallies Macatter (signed); for 1/12 interest, Luke Ryan (signed); for 18,000 livres, Vandenbrucke (signed); for 5,000 livres more, Vandenbrucke (signed); for 1,000 livres and interests, J. Torris (signed); for 1,000 livres for the account of M. le receveur, J. Torris (signed); Id. for the account of M. Hanmque, J. Torris (signed); Id. for different women, J. Torris (signed); 1,000 livres

id. of M. Jn. Diot, J. Torris (signed); 2,000 livres, Ch. Torris (signed); 1,000 livres, Pre. Diot, fils (signed); 1,500 livres, Wante, fils (signed); 32,000 livres for several customers, Wante, fils (signed); 36,000 livres for the account of M. Betrand et Cie of Paris, Riviere (signed); Id. 2,000 livres id.; 1,500 for his own account, Riviere (signed).

The following shows the special terms under which enlistments were made under a "freebooter's contract."

We hereby make it known by these presents that we have of our own will engaged ourselves to serve on board the brigantine, *The Black Princess*, equipped with two 12-pound and twenty-four 8-pound guns and 14 swivels, and armed at Boulogne by Mr. J. Torris, merchant in this city of Dunkerque, and placed under the command of Capt. Edw. Macatter for a privateering expedition; and this service is to be performed without wages for two or four months, at the option of the aforesaid J. Torris, who is authorized by these presents to disarm the said vessel after two months of effective service on the sea, if he finds that circumstances are unfavorable to complete the four months of effective service; and we have agreed with the said Sir J. Torris that instead of wages we shall divide among ourselves half of the net proceeds of all prizes, ransoms and captures when and after deduction has been made for the total amount of the cost of the vessel, of ammunition, provisions and armament, which shall be taken out of the proceeds of the first captures made. It will be permitted to the said Sir J. Torris, at the end of the cruise and at the time of the disarmament, to take for himself the aforesaid vessel with all which belongs to it on the basis of estimate to be made of its value, and experts to be named by M. M. the officers of the Admiralty will make this estimate. We agree and consent unanimously that this shall be substituted for the sale which is ordinarily made of vessels in such cases, and, inasmuch as we might have need of certain advances of money for our clothes and other necessities, we promise each one individually to repay to the said Sir J. Torris all which he may have advanced to us individually, such sums to be paid by deduction from our shares in the first prizes or in any way which he chooses. We furthermore declare ourselves content and satisfied with shares in the proceeds of prizes and with the posts assigned to us by the direction of the bureau of the marine of this port, and we promise to be faithful and obedient to our captain and officers as good servants, under penalty provided by the ordinances of the king. Dunkerque, 15 November, 1780.

If one reads between the lines of these two documents, it is very easy to see that Sir Torris profited from the presence of foreigners in order to escape from the exactions of the royal ordinances which he did not find to his liking and in order to enjoy rights which those ordinances would have refused him, and, in a word, to make himself, so far as financial interests were concerned.

master of the situation, which was the surest means of carving for himself at the proper moment the lion's share.

The minister did not await the outbreak of complaints from the crews and other individuals, which were provoked in the month of August by the conduct of Torris, before being alarmed by the tenor of such contracts. The danger was signaled by the general secretary of the minister of the marine, who was frequently sent on a voyage of inspection in the ports of the kingdom and who was particularly competent in matters concerning privateering. His name was Sir Chardon. The minister wrote on 30th May, 1780, to the Admiralty of Dunkerque in the following terms:

M. Chardon has informed me, Sirs, of a contract of armament which Sir Torris has presented for the *Sans Peur*. The terms in which this contract is conceived are so contrary to regulations that I am amazed that you have permitted its registration. That clause alone by which the interested parties declare that they renounce the benefits guaranteed by all ordinances, contrary to the terms of the said contract, is so contrary to the maintenance of good order that it should have aroused the vigilance of the administration and should have engaged the procurator of the king, whose function it is to supervise the enforcement of the laws concerning privateers, to demand the suppression of this contract; and a decision should have been rendered in conformity to his demand. The will of His Majesty is that this contract be suppressed, and that you take the steps necessary to have its terms changed in conformity to the law. You should see to it that in the future no contract be registered which is not in conformity to the law, to the regulations and the maintenance of good order. (Signed) de Sartine.[40]

The judges of the Admiralty at first rendered a provisional decision condemning the articles of the contract which were contrary to the royal declaration governing privateering, and then prepared to render a second and final decision in obedience to the minister, who, on July 5, formally commanded them again "to see to it that in the future no contract be made of such irregular character as that of Sir Torris."[41]

In the meanwhile the *Black Prince* and the *Black Princess* were capturing prizes. Wishing to profit from the terms of his contract, Torris sought to escape from the jurisdiction of the Admiralty, to which he of course was subject, by submitting his prizes to the judgment of foreign courts and thus renouncing the authority of his own sovereign.

[40] Arch. Greffe, Reg. arr., règl., ord., f. 21.
[41] *Ibid.*, f. 33.

"The armaments which Sir Torris has made for Congress," de Sartine wrote on August 11, "and the letters of marque which he has attained from it, do not free him from being subject to the jurisdiction of the Admiralty. If his pretensions were allowed, it would mean the overthrow of all order, and it would be impossible for His Majesty to tolerate it without compromising the inherent rights of his sovereignty. Consequently his will is that the liquidation and final settlement be made before you for all prizes which may have been made by the privateers which he has equipped for Congress." De Sartine commanded the judges to protect the interests of the crews and investors and closed his letter as follows: "You shall see to the execution of the orders of His Majesty in regard to this matter. Besides, inasmuch as the letters of marque issued by Congress in favor of Sir Torris should have been withdrawn, as all others of this nature which have been accorded to subjects of the king, I hereby notify him that he can no longer have his vessels sail under any other flag than that of France."[42] These orders were supplemented on August 10, 1780, by the following letter from the king to the Admiral of France:

My Cousin, I am informed that certain contentions have arisen in regard to the judgment of prizes made by privateers which have been equipped by the authority of the United States of America in the ports of France, and which the commissioners of the *conseil des prises* have considered themselves incompetent to judge. In order to allay all uncertainty in regard to the matter, I am writing you this letter to say that my will is that the prizes captured by privateers armed by the authority of the United States within this realm and conducted into any of my ports, be judged by the aforesaid *conseil des prises* under the same form as that employed for the judgment of privateers armed by my subjects, and that consequently the officers of the Admiralty observe in regard to them the formalities prescribed by my declaration of June 24, 1778. In order to insure the complete execution of my wishes in this respect, you shall make this known in all the ports, so that the captains of these vessels be informed of it and conduct themselves accordingly, as also the officers of the Admiralty. I pray God, my cousin, that he hold you under His body and sacred protection. Written at Versailles, 10 August, 1784. (Signed) Louis.
de Sartine.[43]

Torris, nevertheless, so complicated matters that, in order to proceed to the liquidation of the prizes and not postpone it in-

[42] *Ibid.*, f. 40.
[43] *Ibid.*, f. 41.

definitely to the detriment of the interests of the crews, it was necessary to recognize the papers which he produced. They were, of course, not in conformity to the requirements of the ordinances, but this irregularity of procedure was excused on the grounds that the armament dated from a time when the king had not as yet made known his intentions concerning the formalities to be observed in regard to the prizes captured by American privateers armed in France. The Minister of the Marine, Marquis de Castries, ordered that one should not fail to collect from the proceeds of these prizes six deniers the livre for the profit of the Invalides de la Marine. Torris attempted to escape from the payment of this tax.[44] The bad faith of this *armateur* appeared again at the end of the war. Luke Ryan, a captain, was made prisoner. The English prepared to treat him as a rebel, and consequently to inflict capital punishment. Torris implored the French government to intervene. "Repeated efforts" were made in his behalf at the court of London and success was obtained "in saving the life of this brave sailor." But then Ryan was kept imprisoned for debts. He was still in prison in May, 1783, and Marquis de Castries wrote to d'Anglemont: "It is of importance that you make this *armateur* (Torris) procure at once the liberty of Luke Ryan, Esq., either by paying the debts which he owes or by giving bond for the same, except as to those debts against him which may be exaggerated, but the liquidation of which cannot be delayed without giving rise to just measures against Sir Torris." Captains were generally interested in the operations of their *armateurs*. By a strange coincidence, from the moment that these captains had the misfortune to be captured, the amount of their debts increased enormously during their imprisonment.

The following year Torris had not yet paid the amounts due the crews from the sale of prizes. The minister ordered his prosecution, and the seals were placed upon the house of the *armateur*. Although the cruises of his vessels had proved profitable, his situation became more and more complicated. On June 24, 1785, he demanded from his creditors a large enough allowance for his sustenance. On July 21, his debts were liquidated, but this formality did not close up affairs, because in 1788 we find him still in a state of bankruptcy.[45] Other *armateurs* endured

[44] Arch. Greffe, Reg. arr., règl., ord. f. 72; 26 November, 1780.
[45] Arch. Mar. Dunk., B 2, reg. 13, 14, 15, 19.

the same fate at the end of the war, and they were not those whom the fortunes of the war favored the least. Their lack of square dealing necessitated court procedures, and officers of justice absorbed a large part of the profits. Thus, Moultson and Drew captured the *Apollo.* A dispute arose with their *armateurs* as to the division of profits. The court procedures cost 29,500 livres.

* * *

The composition of the crews of the vessels commanded by American privateersmen is very similar to that of those commanded by the French. It offers the same strange mixture of men of all nations. Thus, out of 191 men aboard the *Black Princess* in August, 1781, 60 were foreigners of different nations, licentious soldiers and volunteers from every source. When this vessel sailed from the road of Morlaix, the coasting-pilot who conducted it counted 230 individuals instead of 191. The additional 39 kept themselves in hiding up to the moment that the vessel reached the open sea. They were evidently deserters from Brest or neighboring regiments.

These crews proved themselves not inferior to the others. When, on August 8, 1782, at 10 o'clock in the morning, one Robert Jackson, aboard *La Fantaisie,* Captain Richard Boorn, "jumped into the sea because he was possessed of a devil," it was evidently an exception,[46] and when on May 24, 1780, at the capture of the brigantine the *Paquebot de Bridlington,* Captain Hutchinson, by William Fall, in command of *L'Union Américaine,* "the said Captain Hutchinson was killed by a sailor aboard his vessel with a pistol which 'went off' at his side," it was evidently an accident.[47]

Mutineers were rare. We have found only two cases indicated. In January, 1781, Fall, commanding the *Sans Peur,* was in the road of Dunkerque. His crew mutinied and, wishing to blow up the vessel, threatened to deliver it into the hands of the English. The captain fired a cannon to summon a boat of the port to his aid, which failed to respond. Fall succeeded, nevertheless, in overpowering the mutineers and placing them in irons. He went ashore to file his complaint with the commissioner of the marine, Quenel, who arrested the prisoners and imprisoned them in the

[46] Arch. Greffe, Rap. guerre, f. 31 v°.
[47] *Ibid.,* f. 68 v°.

jail of the Admiralty. The number of the mutineers is not indicated, but it could not have been large because Fall was able to equip his vessel immediately afterwards.[48] The other case of insubordination was that of the cutter *Phenix,* mounting twelve 4-pounders, and carrying a crew of 53 men. Having sailed from Dunkerque on November 11, 1781, it had captured one prize and accepted four ransoms when, in the act of taking possession of another captured vessel, the sixth in number, nine or ten of the crew disappeared in the hold of the vessel. The captain, George Ryend, sent one of his officers, Edmund Allen, to demand an explanation. They replied that they refused to perform the watch and one of them, shaking his fist, declared that "if an attempt was made to punish any one of them, one would have to settle with all." Ryend was compelled under these conditions to be content with the ransom of his last prize instead of sending it to be sold in France. The fires of mutiny were smoldering. A plot was formed to direct the vessel into some port of England and, at another time to blow up the ship. Having learned of the plot, Ryend and his état-major formed the resolution to place their prisoners and hostages in irons in order to be more secure, and then returned to Dunkerque, where they debarked the three leading mutineers. One of the hostages profited from the occasion to make his escape. The cruise was thus interrupted in full success and everyone suffered loss as a consequence.[49]

On the whole, the Americans conducted privateering like the French. Conditions were about the same, as were the tactics employed. Privateersmen employed a code of signals to communicate with one another. They carried a full set of flags of the different nations to serve in emergencies. Thus they flew the flag of the United States,[50] which the king formally forbade. Maccatter, who violated this regulation with ostentation even on sailing out of the harbor of Morlaix and passing near the Château du Tauvean, was signaled to the Admiralty officers as a person to be arrested in case of a repetition of this act. He again came under the ban of the law in persisting to give uniforms to his volunteers, which was formally forbidden.[51]

[48] *Ibid.,* f. 150.
[49] *Ibid.,* f. 204 v°.
[50] *Ibid.,* f. 55.
[51] Arch. Mar. Dunk., B 2, reg. II.

With greater facility than the French, the Americans in case of danger protected themselves by the employment of the British flag. Thus Ripner passed without trouble a British fleet under the escort of a double-bridged vessel, two frigates and two cutters. Codner, on being chased by a cutter of the royal marine, dissimulated himself among the small boats off the coast of England.[52] Each one employed tricks after his own fashion. Richard Boorn, having captured a brigantine with a cargo of grain and cloth, the *Rodney* by name, found it equipped with one iron cannon, one switzel and four cannon made *of wood*.[53]

The letters given for ransom were the subject of many smart practices. It was necessary to hide them in case of capture in order that the enemy might not destroy them. Double and triple copies were made of them. On July 2, 1781, Codner, captured by a hostile frigate, was conducted with his crew onto the aft-deck, "where they were searched even to the skin; but fortunately the letters of ransom could not be found, for Captain Codner had confided them to the ship's cook, who was hump-backed and who alone of the crew remained on board of the captured vessel to prepare a meal, and who thus saved the letters, which were hidden beneath his hump."[54] Even when the letters of ransom were recognized as good and valuable, English merchants had an unfailing escape from paying them; namely, by leaving their hostages in prison indefinitely, so that at the end of some years the expenses of maintaining the prisoners exceeded the profits of the capture and the captors released them.[55]

The English were not kind to the Americans whom they captured at sea. They treated them as rebels. Even under Louis XIV they considered as a deserter a captain of Dunkerque who spoke their language admirably and whose name had the sound of an Anglo-Saxon one. He was confided to the care of three soldiers, who were ordered to prevent him from sleeping until he died from fatigue. The American captains were forced to conceal their identity. Kenny conducted all of his expeditions under the name of Jean Grumblé and his brevet of lieutenant of

[52] Arch. Greffe, Rapp. guerre, f. 104.
[53] *Ibid.*, f. 159.
[54] *Ibid.*, f. 188 v°.
[55] A hostage captured by Moultson and kept imprisoned cost the captors 9,389 liv., 19 s., 1 d.

the royal frigate was granted to him under this pseudonym.[56] Many of those who displayed the greatest courage, and consequently most exposed themselves to dangers, received from the king this same brevet "in order to deliver them so far as it was possible from the bad treatment which they had to fear from the enemy in case of capture." They were granted by exception such brevets even when they commanded vessels of less than thirty cannon. In case of capture the quality of being an officer of the king was a powerful safeguard and the French government had that much more authority to interfere in their behalf. When cases arose it did not fail to do so.

The Americans, however, did not show themselves too severe toward their prisoners. They took care of those who were sick. Even in opposition to the royal ordinances which demanded their maintenance to serve for exchanges, they surrendered them under the least pretext, either by entrusting them to neutral vessels met on the seas or by letting them loose upon the shores of England. Sometimes they enlisted them in their own crews. It is very readily understood that these recruits did not offer all the security desired. Thus Merchant, having forced about a dozen of his prisoners to take the oath of allegiance to the United States, could have been only a little surprised when he sent them ashore on the English coast for a supply of water and failed to see them return. We may note in passing that it was a common practice to take a supply of water on the English coast. They always paid the inhabitants for it, as likewise they always paid for the fish which they took from English fishermen.[57]

Much better, one notes that kindly feelings toward men of the same race were stirred in their hearts. Ripner in the midst of rough weather, saw "a man in a red shirt" floating upon a raft. He made all possible efforts to save him and was prevented from doing so only by the state of the sea.[58] Christopher Codner, during a cruise upon *L'Union Américaine*, "saw the wreckage of a vessel upon the water, and in order to be ready to render services to humanity in case someone was found clinging to the wreck, he lowered his skiff and toward six o'clock in the morning he

[56] Arch. Mar. Dunk., B 2, reg. II.
[57] Arch. Greffe, *passim*.
[58] Arch. Greffe, Rapp. guerre, f. 104.

rescued a barrel of porter containing about 40 "fols." which was tapped and drunk by the crew." [59]

III

In conducting their cruises, many of the privateersmen thought of growing rich above everything else. There was a certain number of them, nevertheless, whose spirits were fired by an ardent patriotism and who gave proof of the greatest courage, sometimes of an incredible audacity.

When, on July 2, 1781, Christopher Codner was obliged to surrender, he did so only after having sustained a valiant struggle aboard his lugger, *L'Union Américaine,* against a frigate, the *Iphigénie,* Captain Hope, and a sloop of war, both of which cannonaded him within pistol shot. After several 12-pounders had made holes through his ship, the enemy boarded his vessel and were obliged to strike his colors with their own hands.[60] John Chitty, in command of the *Resolution,* gave chase to a brig, armed with six 6-pounders, which had fired a volley at him. He abandoned the chase a moment to effect the capture of a sloop at close quarters and then returned to the chase. After an hour and a half of combat, the brig lowered her pennant. Chitty came alongside to take possession. At his arrival, the brig broke her pennant aloft and let go her row of cannon, "empoisoned with mitraille." Chitty had one killed, four wounded and his vessel hit five times at the water-line. He was compelled to let the enemy escape (July 9, 1781).[61]

Bennett Negus sailed from Dunkerque on April 13, 1781, aboard the *Franklin,* a ketch of 280 tons, mounting twenty 8-pound cannon and carrying 157 men, and equipped by Sir Salomez. On the morrow, off Boulogne, he was chased by two royal English cutters. Without hesitating he came about and engaged battle, which lasted an hour. At the end of that time the enemy gave up the fight, after having twice refused battle at close quarters. On the 18th, he gave chase to several vessels to the entrance of the roads of St. Helens, and during two hours and a half he maintained a fight against three 14- and 16-gun cutters, which sought refuge near the shore under the protection

[59] *Ibid.,* f. 166
[60] *Ibid.,* f. 188 v°.
[61] *Ibid.,* f. 198 v°.

of the fort, whose fire forced Negus to regain the open sea. He had one killed and one wounded. On the 20th, he threw a brigantine upon the coast and captured a privateer armed with ten cannon. On the 22d, he chased another vessel of 16 guns to within three lieues of Falmouth, then a three-master. The enemy sent a lugger, armed with ten 4-pound guns, with orders to guard him during the night. He calmly cast anchor at one lieue from Falmouth-point to await the vessels which would sail at high tide. At six o'clock in the morning he perceived the lugger which guarded him. It was joined shortly by another lugger of 16 guns and a large cutter armed with twenty-six 9- and 12-pound cannon. All three gave chase and overtook him at six o'clock in the afternoon at ten lieues from Ouessant. After two hours of cannonading Negus attempted to come to the cutter at close quarters. Blood flowed in torrents. The bowsprit of the enemy became engaged in the rigging of the *Franklin,* whose crew, having already well shown their courage, became furious and, striking right and left with axes and sabres, destroyed the part within their reach. The two luggers in the meanwhile continued to cannonade. The cutter profited from the night-fall to quit the combat at close quarters and "fought no more except in retreating." Negus had six killed and 16 wounded and was compelled to go to Brest for repairs on the 24th. He resailed from that port on May 3, was cruising on the 5th near the Scilly Isles, where he captured the *Lady Graft,* en route from St. Eustache to London with a cargo of tobacco, sugar, coffee and indigo, and later he captured the *Diana,* armed with fourteen 12-pound guns and probably with a cargo. These two ships were a part of the fleet aboard which Admiral Rodney sent the fruits of his pillage of St. Eustache and which La Motte-Picquet had recently dispersed and put to route. Negus conducted the two prizes to safety at Lorient, where he equipped his vessel anew. Six days later he received 1000 guineas for the ransom of a brigantine which he captured on its way from Waterford to Cork, and he sank a sloop whose crew escaped to the shore. On the morrow (the 25th) he gave chase to a flute which had letters of marque and was equipped with twenty-two guns of 12- to 18-pounds. During the course of the cannonading his vessel was struck near the water-line, which caused such a bad leak that he was forced to retire, having two killed and six wounded. On the 26th and

27th he received ransom for five vessels and burnt a sixth. He touched at Cherbourg, then regained Dunkerque on June 3. This brilliant cruise yielded 1,065,947 liv. 16s. 11d.[62]

In addition to the profits which came from their shares in prizes, the families of the killed and wounded received at the end of active cruises supplementary indemnities. Thus, after a bloody battle fought on July 17, 1781, by Moultson, commanding *La Victoire,* this captain, who was seriously wounded in the right thigh, received as a recompense twelve shares, and the second in command ten shares. At the end of the cruise of *La Princesse Noire de Boulogne,* which under the command of Maccatter yielded 1,048,627 liv. 15s. 9d. (10th March-9th October, 1781), the following list of gratifications in favor of the killed and wounded was made: a lieutenant, killed, 300 livres; a director of prize vessels, killed, 200 livres; a wounded, 2000 livres; idem, 500 livres; idem, 300 livres; idem, 500 livres; idem, 200 livres; one burned, 200 livres.[63] Such casualities were a part of the profession. One must add that the corsairs did not always meet with stubborn resistance. Thus Luke Ryan, commanding the frigate *Le Calonne,* sent his lieutenant, Ménage, to capture a ketch. Ménage boarded her and "found the crew changing their shirts and packing up their belongings." The first person whom he encountered was the captain, who congratulated him on his capture and exclaimed in English "Fortune of war, I am captured!"[64] Adversaries of such happy dispositions were, to be sure, too rare, but between such and stubborn resistance there were varying degrees. William Fall, commanding *La Marquise de Castries,* set sail on December 12, 1782, from Morlaix, where he had been for repairs, and on the morrow gave chase near Start-point to a brigantine which, flying only a red "fly-pennant" at the main-mast, without any ensign, was making at full sail for the

[62] *Ibid.,* f. 163.

[63] The proceeds of this cruise yielded, in liquidation for the half belonging to the crew, 325,893 liv. 5 s. 10 d., "from which sum deduction should be made for expenditures for wagons, horses, boats, inquiries, imprisonments, furniture and effects broken and destroyed in inns, entertainment, liquor and other extraordinary and excessive expenses made and caused by the said crew, 60,121 liv. 4 s." The 24 shares of the captain produced 6281 liv. 4 s. 3 d., which, after deductions were made for advances made, yielded him 660 liv. 11 s.—Arch. Greffe.

[64] Arch. Greffe, Rapp. guerre, f. 146 v°.

coasts of England. Having overtaken her, Fall commanded surrender. The captain of the brigantine, Brown by name, refused with many round oaths in English. But under the threat of being fired upon, Brown tried to come about in such a way as to break the bowsprit of his opponent by entangling it between the masts and rigging of his own vessel. He did not succeed, but in the collision the boom of the fore-sail, four futtocks, the two fore-davits, the jib-stay of *La Marquise de Castries* were broken and a few planks split near the railing. Some of Fall's crew seized hold of the rigging of the brigantine in order to disengage their bowsprit. Captain Brown came about again, paying no attention to the sailors of *La Marquise de Castries* who clung aloft in his rigging. Unfortunately for him the latter outnumbered his own crew, and they took possession of his ship. Fall then came alongside and boarded his prize, which was named *Les Trois Sœurs* and was en route from St. Domingo to Altona with a cargo of colonial products. Brown still continued to defend himself by pretending that he was a Dane. After being conducted to Dunkerque he filed complaint before the Admiralty that his adversaries had insulted his flag by tearing it into strips and making belts out of it.

No attempt can be made here to give an account of all the combats of which the stories have been preserved in the records of the war. We cannot, however, pass in silence the cruise of the *Sans Peur* conducted under the command of William Fall from May 12 to July 16, 1781, which is admirable for the story of valor which it contains. Fall made three cruises aboard this vessel, which was a cutter of 120 tons equipped by Porean and Co. with 19 guns, 12 swivels and 85 men. These cruises yielded together 424,015 liv. 0 s. 7 d. We shall here recount the story of the second.[85]

Fall sailed on this cruise May 12. The same day he stopped a packet, from which he demanded 6 guineas. The 16th he gave chase to a brigantine which seemed to be a privateer armed with eighteen 9-pound guns and which, after a short engagement, took refuge under the fort of Bamburgh, whose cannon forced the *Sans Peur* to retire. On the 18th, he stopped a sloop which had already been captured and released on ransom of 350 guineas by Cottin, captain of *Le Boulogne*. On the 20th he captured two

[85] Arch. Greffe, doss. liquid., and Rapp. guerre, f. 170 v°.

brigantines, which were sent to Holland. On the 21st he chased another to the entry of the port of Dunbar. He cannonaded it with such persistence that his shot fell in the heart of the city. He retired after having supported the fire of a cutter which was anchored in the harbor. On the 22d, at the Isle of May, he forced the inhabitants to bring him a supply of water and debarked there 14 prisoners, who signed a paper certifying to their release. On the 23d he captured two sloops and arrived within cannon shot of the city of Arbroath. He sent some of the crew of one of the sloops ashore to deliver a message to the commander of the city which demanded ransom money under penalty of being bombarded. The commander inquired how much ransom was demanded. Fall in turn sent representatives to make known his conditions. The reply of the commander seemed ambiguous, whereupon Fall sent a second message. After waiting in vain for a reply for one hour and a half, he brought his vessel within pistol shot of the city, upon which he opened fire and continued until half-past ten o'clock. On the appearance of his representatives he ceased fire, but on learning of a refusal to pay the ransom he reopened fire, which continued until half-past eleven. He captured a sloop which was anchored near by. On the 24th, after having received ransom for the two sloops, Fall regained with a freshening wind the open sea. He captured and released on ransom another sloop on the 25th, and then pursued a cutter which took refuge under the forts of New Aberdeen, where another vessel seemed to be anchored. These two vessels were both privateers, equipped with 16 and eight guns, which, together with the land batteries, opened fire upon the *San Peur*. Fall replied with vigor and captured in succession the two privateers, after fights at close range. On the 26th he stripped one of them of all things of value and then set fire to it; the other he baptised *La Liberté* and placed her under the command of his lieutenant. Magery. On the 29th he captured the *Flying Fire,* a lugger armed with four 6-pound guns and two swivels, and carrying a crew of 30 men. He placed one of his men, Vasseur, in command of her, with orders to keep close to him. It was thus that Fall found himself in command of a small fleet.

On June 3 he lost sight of Vasseur and the *Flying Fire*. On the same day he captured the packet from Harwich to Hellevoetsluis, which was equipped with 12 cannon. After having anchored

in the road of Flushing, the *Sans Peur* and *La Liberté* continued their route to Middleburg. As the Dutch had removed the buoys, Fall ran aground, and before he had time to warn Magery, the latter did the same thing. At high tide the *Sans Peur* was refloated. *La Liberté,* however, although her guns were taken from her board, could not be refloated. People came from the shore in small boats and forbade him to continue his work of rescue He was forced to abandon it. He set sail on July 1 and, forced by strong winds, he anchored in the harbor of Middleburg. He hoisted sail again on the 3d, fought with two cutters on the 6th and was forced on the 7th by an armed frigate to give up the chase of a brigantine. On the 11th he was off Aberdeen and obtained ransom for three sloops. He was chased by a frigate, the wind was strong and his main-mast cracked in an alarming fashion. Nightfall came, he cast overboard a large barrel with a fire-signal, in order to deceive the enemy as to his direction, and then changed his course. At daylight he perceived that the frigate had disappeared. On the 14th, Fall encountered a fleet of 19 vessels coming from the Baltic, ten of which were three-masters, equipped with ten to 14 guns. The fire opened upon him left him in such a state that he was unable to undertake further captures. He sailed for Dunkerque, where he arrived happily on July 16.

It is very easy to understand that after such exploits William Fall was named lieutenant of the king's frigate on April 7, 1782, and began service with this rank on June 30.[66]

In addition to such cruises of long duration, Fall did not hesitate to attempt sudden adventures. As, for instance, one day [March or May 13, 1782], when on the quay at Dunkerque he was looking out at sea, he noticed anchored down the harbor at a distance of three-quarters of a lieue a sloop and a brigantine, both English. The idea at once came to him to capture them. He communicated it to four sailors near by, who approved it. He made an agreement with Sir Corbeau, an employee of his *armateurs,* Porean and Co., and secured his letters of marque and his brevet of lieutenant of the king's frigate. He borrowed a boat "from one of his acquaintances," and boarded *L'Entreprise,* a privateer under the command of another American, Thomas Fairley, who lent him some muskets and sabres. He and his men

[66] Arch. Mar. Dunk., B 2, reg. 11.

left their capes and greatcoats and then continued their way down the harbor.

John Chitty had formed the same idea about the same time. After a bit of difficulty, he obtained from the aforesaid Fairley the great boat of *L'Entreprise,* which he baptised *Good Luck* and which he equipped under the direction of Degravier and Watel, who at that time were arming for him *L'Actif* as a privateer. Aboard his boat he embarked Magery and six other compatriots who were hastily enlisted, borrowed again from *L'Entreprise* four swivels and a demijohn of gin, and then in his turn went down the harbor.

Fall and Chitty seized without striking a blow the two vessels, the *Ashburton* and the *Diligence,* the sale of which yielded respectively 72,339 liv. 17 s. 1 d. and 27,855 liv. 5 s., or a total of 100,195 liv. 3 s. 1 d. A deduction was made from this amount of 5227 liv. 3 s. for judicial procedures which were necessitated in order to have a settlement between the two captains, who had acted in harmony to effect the capture but were in disagreement over the division of profits. Fairley filed claim for damages to his large boat, which had its rudder and an oar broken.[67]

Thomas Abbott and Richard Ryend took part in the expedition under the orders of Chitty, and with the same captain they sailed shortly afterwards on a cruise aboard the *Renard,* one as pilot, and the other as second mate. At their return they bought from Sir Guilleman, one of the captains in the expedition where Royer lost his life, a cutter. They planned to arm her as a privateer at Calais and engaged Altazin, a sailor, to conduct her to that port. They were ready to make this short voyage when they learned that their cutter had disappeared from the port. Smugglers alone were capable of such an act. They hastened to Calais, but found no trace of their property. They took passage for England, where they learned that the thieves had grounded on a sand bank and the cutter had filled with water, and that those aboard had just enough time to gain the shore, where they destroyed her. Determined to make good their loss, Abbott and Ryend went to the bay of Westable, and seized the first boat which they could lay their hands upon in order to reach a sloop which was riding at anchor. They boarded her, opened the hatchway

[67] Arch. Greffe, Rapp. guerre, f. 229, 230, 232 and doss. liquid.

and found no one aboard. Cutting the cable they hoisted sail and arrived without accident at Dunkerque. They implored the favor of the judges of the Admiralty, explaining that they had only wished to take their revenge, and demanded the confiscation of the sloop as good prize to reimburse them for their loss. A decision was rendered in their favor (February, 1782).[68]

Such adventures are relatively frequent. On October 12, 1782, Davenport, an officer of the marine, demanded a large skiff, *L'Arlequin* by name, to attempt with five of his compatriots an adventure at the arrival of an English fleet in the roads of The Downs.[69] Success did not always crown such efforts, however. Thus, in the month of May of that same year, Thomas Roberts armed as a filibuster at Calais the *Trial*, a smuggler, manned by a crew of 12 English and Americans. Having sailed from the port on the 2d, they were chased during the night of the 3d by a sloop and were compelled to seek refuge at the coast of Dover. Seven of the crew deserted, although they ran no risk of capture, because the inhabitants mistook them for smugglers. Roberts did not dare return to his vessel. Together with three sailors he fled by the woods and across country to the bay of Westable, where he arrived on the 6th. Thence aboard a ketch he reached Gravelines. "They cowardly abandoned a vessel which no one thought of seizing" remark the records of procedure in speaking of the seven deserters.[70]

The seizures of small boats by prisoners to effect their escape are frequent enough. Neither Jean Bart nor Souville has a monopoly in the matter. The story of two men of the crew of John Chitty may serve as an illustration. Captured on April 20, 1782, by *L'Actif*, a cutter, William Robertson and Joseph Green were at first kept in irons during 11 weeks aboard the *Dromedary*, which served as a prison-ship for The Downs. Thence they were transferred aboard the *Panton* (?), a vessel equipped with 64 cannon. They were later placed aboard a prize captured by this vessel to be conducted to Plymouth. Two days after their arrival they spied a rowboat belonging to a man-of-war anchored close alongside. They embarked in it on July 26 with a small quantity of wine which they had smuggled from the prize, and then gained

[68] Arch. Greffe, Rapp. guerre, f. 223 v°.
[69] Arch. Mar. Dunk., B 2, reg. 12.
[70] Arch. Greffe.

the open sea by rowing. They arrived at Dunkerque on the morning of August 1, after having been five days and five nights without food.[71]

* * *

If privateers had many acts of courage to their credit, one is compelled to cite also certain acts less creditable. It is useless to try to expose here the reasons which prove that their real conduct was much better than their reputation would have us think. The confusion which ordinarily exists in the public mind between privateers, who are licensed combatants, and pirates, who are simple robbers, perhaps explains their bad reputation. After having examined the complete series of documents in the archives of Dunkerque for the period of the war of American independence, we can affirm that the cases of pillage by the corsairs are exceedingly rare. One of them, very exceptionally, offers a certain bit of importance by reason of the character of one of the persons who was the victim. The rest amount to very little. If one accepts the testimony of the papers presented by the *armateurs* in making their reports, one will find many acts of bad faith which harmed the privateers themselves more than the privateers harmed others.

What do we find in fact against American privateers? On December 29, 1781, Kiff, first lieutenant aboard the *Sans Peur*, took possession of some marine instruments and charts which he found aboard a prize.[72] Drew, on November 29, 1782, sent a lieutenant and a sailor aboard a brigantine which had just been captured, to seize an octant, some books and a bed, all of which ordinarily fell to the captain of the prize. The sailor took for himself 65 guineas which he found in the pocket of the English captain's brother, and which represented the amount collected for freight. The lieutenant forced him to give it up and turn it over to Drew.[73] In the spring of 1781, de Neville Bucan, a captain of prizes, was condemned as *particeps criminis* in the theft of some bottles. On board one of the prizes captured by Fall was a Russian messenger whose clothes were stolen. The minister of the marine threatened to have Fall imprisoned, although he had no hand in the affair, until the clothes were restored.[74] And that is all. To

[71] Arch. Greffe, Rapp. guerre, f. 23 v°.
[72] *Ibid.*, f. 137.
[73] *Ibid.*, f. 66
[74] Arch. Mar. Dunk., B 2, reg. 11.

tell the truth, they are but bagatelles, and they were not always recognized as true after an investigation had been made. A simple desire for personal vengeance sometimes furnished the motives for a sailor to make a false denunciation. One must not forget that the royal ordinances permitted and regulated plunder of provisions aboard prizes. In the heat of action errors were easily committed which were excusable in certain cases, and which, as a rule, were discovered and punished.

The most important case of pillage for the part of the war which occupies our attention, and in fact the only case which one can really call pillage, deserves to be told in detail. It lacks neither animation nor variety nor the picturesque, and gives one an insight into the curious traits of the life of privateers, which we have not found elsewhere so well described as in the records of the procedures and in the correspondence which this case occasioned.[73]

Jean-Etienne, Marquis de Ségur-Bouzely, about 50 years old, formerly lieutenant of the king, colonel of infantry in the marine service, was returing from Guadeloupe, where he had just resigned the command of Grande-Terre. His companions of voyage were Sir Jean-Luc Druault, lieutenant in the marine infantry, and a man of advanced age, Sir Augustin de Linières, an inhabitant of Gaudeloupe. Messrs. de Ségur, Druault and de Linières, instead of embarking on a French vessel where they would have run the risk of being stopped and made prisoners, preferred to take passage aboard a neutral vessel, thus hoping to escape the danger of capture. They bargained for their passage with the captain of one of the vessels of the Royal Company of Denmark, the *Emiliard*. The captain made them pay a high price for the security which his vessel offered to them.

Nevertheless, as they approached the waters of Europe, Marquis de Ségur did not conceal his satisfaction. He had noticed on the sea an English fleet of one hundred sail bound to England from Jamaica. By calculating its speed with that of the *Emiliard*, he estimated that he would land in a port of France 15 days

[73] Documents utilized for this episode: Arch. Communales de Dunkerque, 189, dossier de procédure, and 203, liasse; Arch. de la Marine à Dunkerque, B 2, reg. 12; Archives du greffe du tribunal de commerce de Dunkerque, Rapports de guerre 1779-1783; Dossiers de liquidations de prises (not classified); Registre des arrêts, édits, déclarations, etc., t. II.

before these vessels could reach the coasts of England. He would thus be able to announce the fact to Marquis de Castries, Minister of the Marine, who would have time to make preparations and capture the fleet. Marquis de Ségur would thereby render an important service to the nation and, thanks to the information furnished to the minister, "he would at the same time have an occasion to seek his favor for his own personal advancement."

An unfortunate event interrupted this dream of joy and destroyed his hopes. While the *Emiliard* was passing in sight of Cape Lizard, it crossed the pathway of a privateer of about 150 tons, which, on sighting it, hoisted the English ensign and fired a shot. The Dane could only respond to the summons by surrender. A boat lowered from the privateer came alongside and several men boarded her. He who was in command ordered the Danish captain to produce his papers, which were examined and found to be in rule. He demanded money, then the keys to the chests of the passengers, who were easily recognized to be Frenchmen of quality. One was thus forced to give money and the keys with which the chests were opened. The effects and papers contained therein were pillaged. "Marquis de Ségur was one of the victims who suffered the most from the pillage. Everything was taken from him, two chests filled with the finest linen, a fine costume, the complete livery of two lackeys and, besides, jewels, gold-braid and his seal with its case (in the margin here is written in the hand of M. de Ségur, 'many pairs of lace cuffs and many cases of liqueur'), all of which might be valued at 250 louis at least. Very fortunate was this gentleman to get off with the loss of his wardrobe, for, being recognized by one of the brigands as a man of quality, they treated him with the greatest injuries—threatening him with their fists—in order to make him reply to their bravados, which they would have seized as an excuse to cut his throat or to drown him, but this gentleman prudently supported all with patience—and conducted himself most wisely and politely by smiling."

From M. de Linières the corsairs took the hat which he wore and Portuguese money to the value of 12,600 livres; from M. Druault, his hat, buckles and other valuables to the sum of 50 louis. They seized also some preserves and "an American song-bird." They embarked their booty aboard their boat and the *Emiliard* was left free to continue her way. Frightened by the

experience, the Danish captain refused to land his passengers in France according to the agreement made and took them to Copenhagen. Not until some six weeks after their arrival there, did Marquis de Ségur and the lieutenant, Druault, succeed in finding a way of regaining their native land, which cost each of them 4000 livres in expenses of travel and stops. As to the aged M. de Linières, incapable of sustaining the fatigue of such a voyage by land, he was left behind in Denmark, where he awaited a vessel to take him back to France.

There seemed to be small chance that the brigands would ever be found. Chance, however, is a great detective. M. de Linières, having succeeded in finding passage for France, was forced by reason of a leak in his vessel to land at Dunkerque. He had hardly set foot upon the quay of that port when a man stopped to look at him. After having regarded close enough to recognize him, this man accosted him by saying that he was among those who had pillaged him some three months before. He informed him that the privateer and its captain were in the port. He pointed them out to him and straightway disappeared. The fatigue of travel and suffering which he endured prevented M. de Linières to take at once the steps necessary to prosecute the affair. As soon as his health permitted him, however, he filed a complaint with the Commissioner of the Marine, M. d'Anglemont. This officer summoned the captain and one of the officers against whom the complaint had been filed. Their declarations gave no certainty as to the crime being committed by them. Neither the captain nor his crew was further disturbed. M. de Linières grew furious at this result and at the inactivity of the officers of the marine. He wrote to Messrs. de Ségur and Druault and all three together filed a complaint before the minister.

Chance again came to the rescue. In a café at Dunkerque M. de Linières encountered one Del Miquel, who had served aboard the privateer in question. "This young fellow who revolted against his escapades" declared himself prepared to make a true deposition of the facts. M. de Linières conducted him before the commissioner of enlistments. The same day a second member of the crew followed his example and five others did the same on the morrow. The affair began to create a stir. The first lieutenant, Cavaillé by name, who was the officer who had made a deposition at the same time as the captain, began to fear the consequences

of the adventure. He went of his own accord to the bureau of the marine, declared that his first deposition was false and made a new one. The *armateurs* of the privateer, Messrs. Peychiers and Torris, grew frightened in their turn. Counting on suppressing the affair, they made an offer to M. de Linières to make good his losses. The latter refused the offer in saying that "prosecution was necessary in the interest of the public welfare."

Del Miquel was obliged to leave Dunkerque in great haste "By reason of the fact that he had disclosed the affair" he found himself "the victim of his probity and reduced to dire necessity, being forced to leave a place where his life was no longer secure." He sought refuge at Paris at the Hotel of Flanders, rue Froidmanteau. He there waited for M. de Ségur to obtain from the government a situation which would enable him to obtain some means of restoring himself from the losses which he had suffered. As to the "probity" of which he had given proof according to the claims of the plaintiffs, it is perhaps not so real as they thought. In reality, if Del Miquel and the others had denounced the "brigandages" of their officers, it is because they had attributed to themselves all the profit thereof and had failed to give a share to the sailors.

Who then was the guilty captain? His name was Nathaniel Fanning, born in the State of Connecticut and about 28 years old at this time. He had an uncle who was colonel in the English army and who was serving under General Cornwallis. Taken prisoner by the English, he remained 12 months in their hands, then made his escape and gained Dunkerque. He served in quality of second mate aboard the *Éclipse*, a privateer of 150 tons, armed by Nicolas Peychiers and Charles Torris and commanded by one of his compatriots, Nicolas Anthon. Having sailed on November 30, 1781, to commence a cruise, Anthon directed his route toward the channel and captured five ships of the enemy, of which three were rescued by the English and a fourth the *Sandypoint*, placed in command of Jacques Cavaillé, was struck by a projectile from an English fort and sunk, some 300 livres of merchandise being rescued from it. The fifth, with a cargo of woolens, was conducted to Cherbourg and sold for 40,393 liv. 11 s. 8 d. As the armament and equipment of the privateer had cost 210,406 livres, there was a shortage of 177,328 livres 2 s. 6 d. Anthon returned

to port on March 6, 1782. He was commanded to serve as second officer aboard the royal cutter *Pigmy* under the orders of Captain Missiessy. Instead of obeying, Anthon fled. Under the order of the minister of the marine, he was arrested at Brest on June 14 following.

In the absence of Anthon, Fanning received the command of the *Éclipse*. The *armateurs* spent 59,280 livres to put the vessel in condition to undertake a second cruise. He sailed on June 5, and returned on August 12, 1782, having taken four prizes, two of which were rescued by the English and a third was set at freedom by a decision of the Admiralty court. The fourth, the *Friends-Goodwill,* was sold for 62,070 liv. 0 s. 4 d. In addition he sank the *Beaufort,* a sloop without value. His report to the Admiralty failed to mention the neutral vessels which he had searched. On October 22 following, Fanning resailed aboard *Le Rongeur* with a small crew of 24 men and armed by Francois Victor Horeau. Two days later he captured a brig with a cargo of coal and a brigantine, the *June Rose,* which were sold for 21,439 liv. 14 s. 1 d. and 8282 liv. 1 s. 1 d. respectively. On the same day he was captured himself. Fanning made his escape and arrived at Dunkerque on the 26th. It was at this time that he was denounced by Del Miquel.

The Commissioner of the Marine, d'Anglemont, had not seen fit to arrest Fanning or the members of his crew. He attached no more importance to the affair nor did the judges of the Admiralty. M. de Linières appeared to them as a simple planter of Gaudeloupe. The ordinances authorized and even regulated the pillage of personal effects aboard vessels captured by privateers. In general an indemnity was paid by the captors to the captured.[76] It is true that in this case it was not a matter of an enemy captured, but of a neutral vessel on which a privateer had no claim. This fact should have received the attention of M. d'Anglemont, as also that of the royal procurator of the Admiralty, M. Coppens d'Hersin. Another fact of importance should have awakened their inactivity, namely, that one of the passengers robbed was named de Ségur and that the Minister of the Marine, Marquis

[76] A time came even when an indemnity for the coffer of the captured captain, otherwise called the *"captain's hat,"* was paid him by his own *armateur* in the form of a certain percentage varying from 2½ to 5 per cent on the total proceeds of the cruise.

de Castries, was an intimate friend of his colleague the Minister of War, who was none other than Maréchal de Ségur.

Notified of the complaint filed, and displeased that he had not been informed previously of what had taken place, Marquis de Castries sent on November 5 a formal and sharp order to the commissioner of the marine to arrest Fanning and the crew of the *Éclipse*. On the 10th he addressed the following note to the judges of the Admiralty:

> There has been brought to my attention, Sirs, the very serious complaint against the crew of the *Éclipse,* a privateer of Dunkerque armed by Sir Torris, for the pillage which they committed upon the personal effects of Marquis de Ségur and M. de Linières when they were passengers aboard the Danish vessel, *Emiliard.* I am surprised that you have not rendered me an account of a crime of such gravity, of which the procurator of the king could not, in fidelity to his duties, have failed to make complaint, and to have made an investigation of an affair which public rumor must have brought to his knowledge if he had no other means of learning of its existence. You shall inform yourself at once of the state of the affair and render me account of what you do to establish the crime and punish the guilty. I am, Sirs, your humble servant, Castries.

The prosecution of the affair took a more serious turn on the 24th of the same month, when the king, "considering that the criminal procedure which was being pursued at the Admiralty of Dunkerque might become so considerable, by reason of the number of the accused and of the accomplices, and that, if the regular order of justice were followed, the formalities to be observed would cause a prolongation of affairs which would enable the guilty and their accomplices to escape from the punishment which they deserve, and His Majesty also wishing to suppress such disorders by prompt and exemplary punishment, in order to insure public safety to his subjects and to give satisfaction to neutral powers for the insult made to their flag," revoked the procedure into his own hands and into those of the *conseil du roi.* He ordered the lieutenant-general of the Admiralty of Dunkerque to continue the prosecution. Coppens d'Hersin in turn expressed his surprise to learn of the affair by the letter of the minister. The procedure was in truth very complicated, by reason of the fact that it was necessary to pursue it not only at Paris and Dunkerque, but also at Morlaix, Vannes and Lorient. It was conducted thoroughly, thanks to the repeated efforts of the minister and of the general secretary of the marine. Finally the following

were incriminated: Nathaniel Fanning, Thomas Potter, his second in command, N. Morin, captain of prizes, Joseph-Marseille Marthe, sailor, Jacques Cavaillé, lieutenant, and Pierre Carbonnier, carpenter.

Stimulated in their activity by the turn that affairs had taken at Paris and by the pressing commands to conduct the affair "with attention, vigilance and celerity," the judges of the Admiralty acted in harmony with the commissioner of the marine. They began by sending to prison all the sailors of the *Éclipse* on whom they could lay hands. All of them who appeared to enlist for service on outgoing vessels were held in custody to furnish their testimony. These arrests of witnesses were, to be sure, only provisional, but three months later the unfortunate individuals were still groaning behind the bars, and inasmuch as they were forced to bear the expense of their sustenance during their detention in the prisons of the king, they found themselves within a short time without a cent and their families in the greatest distress. By contrast, the chief criminals, Morin, Malthe and, most of all, Thomas Potter, against whom the most serious charges were made, were sailing on waters far away, one knew not where. Sir Bandry, the royal bailiff of the Admiralty, assisted by Charles Oger, "trumpeteer and bourgeois," had proclaimed the three formal summons for them to appear, first before the doors of their lodgings, then before the guard of Place Royale, and a third time before the Council Chamber of the Admiralty. Loafers gathered around in great numbers at the summons, but none of the summoned responded. It was learned that Potter, after a sojourn at Vannes, embarked on October 23 on board the *Renette,* an American vessel. The legs of Bailiff Bandry were certainly not long enough to pursue his man.

It was thus necessary to continue the prosecution of the affair without Potter. Search was made at the store of a merchant of laces where Potter had had his lodgings, 10 rue de Bourgogne; also at the "Coq Hardy," the shop of Ch. Cailliez, where Morin had a lodging; but no other news was obtained than that Morin had, according to report, lost his life at sea; also at the hotel of Comte d'Estaing and at the Cheval Volant, rue St. Jean, of which an Englishman, Williamson, was proprietor. At both of these places Fanning had had lodgings.

On January 20, 1783, Marquis de Ségur communicated to the lieutenant-general of the Admiralty the following letter, which he had just received:

In the harbor of MORLAIX, Jan. 5, 1783.

Sir, In regard to the declaration which I made before M. de La Richeri, commissioner at Dunkerque, concerning the pillage which was committed by the privateer, *Éclipse,* Captain Fanning, I pray you, Sir, to permit me to add to the said declaration that Porter, after having brought a package of effects aboard, distributed them to all of us. I received from his hand a costume ornamented with silver braid, which I burned after my return from my imprisonment in England. If proof of this fact is necessary, I shall say that I burned it in my room, where Sir Harnes, a trader, asked me what I was doing and I told him that I was burning the costume which Porter had given me. Your humble servant, Cavaillé. P. S.—If I did not make this declaration before, it is because the captain advised me not to do so.

Another search was then made at the hotel Comte d'Estaing, *rue ancienne de Nieuport.* Two trunks belonging to Cavaillé were found. A list of their contents deserves mention. They contained a cloak of blue cloth with gold braid at the collar, a coat with red collar, a brown coat, a leather bag with six shirts, two vests of white piqué, one of cotton, ten pocket handkerchiefs, two of silk, one sheet, a towel, two pairs of drawers, an undershirt, a pair of white-plush breeches, another of black velvet mixed with cotton, a pair of silver garter-buckles, three cambric collars, a blue costume with sailor buttons *à fleur-de-lys,* a gold epaulette, a powder sack, four pairs of silk stockings, three of wool, two of cotton, a hat, a small dagger, a case with two razors, a soap case, a pair of slippers, a whip, spurs, a pocket-knife, four gloves, a black round fur hat, a towel, a costume of violet cloth, another of red cloth, two pistols, 36 livres in cash, a roll of marine charts, a pair of black satin breeches, a pair of spurs, a curling-iron, a compass, a syringe, two gold watches with chain and charms, eight white shirts, five soiled shirts, five pairs of silk stockings, one pair of knit stockings, two collars, one sword, a tobacco box, a flask, a comb.

Such a mixed collection could only arouse suspicion as to whence it came. Marquis de Ségur came to Dunkerque to examine it, and he recognized several objects as belonging to him. He found none, however, among the effects of Fanning. Fortunately for Cavaillé, it was learned that the trunk containing the stolen objects had not been left at his lodgings for his own personal count.

It proved very difficult to unravel the confused tangle in the testimony collected from the numerous depositions taken by order of the prosecution. Fanning confessed that he kept two sets of books: one, in english, the inaccuracy of which he recognized, and the other, in cypher, which contained the truth. As by chance, the latter had been lost in the sea. The truth as to what had taken place on board the *Éclipse* came slowly to light.

In spite of his efforts to maintain obedience aboard his vessel, Fanning did not always succeed in holding his crew in the subordination which they owed him. During the course of the cruise, his crew mutinied twice, threatening to depose him from his command, and under threats of violence forced him to return to port before the end of the cruise. He was compelled twice to order Potter, who directed the movement of the mutineers, to remain confined to his cabin. Not being in possession of a text of the royal ordinances on the marine, he was not sure of just what his rights consisted, and the French officials had failed to give him the necessary instruction. If he had flown the English ensign, it was in accordance with a general trick employed in war in order to discover English papers which might be concealed aboard vessels flying the flag of a neutral nation.

Potter had been generally charged with the mission of visiting such neutral vessels, and he did not always perform that mission with all the *finesse* desirable. Thus, aboard a Portuguese vessel he seized unjustly a double-barreled gun, a sword of Damascus, a spy-glass, an octant and several hats ornamented with plumes. Fanning had recommended to him in vain, as to most of the others of his crew, that he should not commit such acts of piracy. Potter continued them notwithstanding.

When Potter returned aboard from the *Emiliard,* he noticed that the pockets of one of the coats stolen contained letters addressed to the king and to the Count of Artois. He threw them into the sea. The sailors of the *Éclipse* murmured when they saw the booty which was brought back. To calm them, he gave them some wine and some of the liqueur which Marquis de Ségur had destined for His Majesty. When Cavaillé objected to such conduct, he threatened to blow out his brains. Potter then tried on one of the beautiful red costumes, which did not fit him. Fanning, who had been busy in his cabin up to that time in dressing a chart and who had "perhaps drunk a little too much," came upon the

deck and tried on the same costume "in a spirit of play and amusement and of cutting a great figure," he declared. He then pulled off the costume, which was seized by one of the volunteers, by the name of Roussel, who hid it in the chest of the master-carpenter, where it was refound by Potter. Potter at first accused the carpenter of theft, but when he learned who was the real culprit, he had him attached to the muzzle of the cannon and tried to have him beaten by the other sailors, but they refused to do so, saying that after all they were not executioners. Thereupon he himself seized a shovel and gave his victim twelve hard energetic blows.

After having thus established the responsibilities, the judges of the Admiralty pronounced a final decision on June 21, 1783:

We hereby declare that Thomas Potter, second captain, N. Morin, captain of prizes, and Joseph-Marseille Mathe, sailor of the *Éclipse* of this port of Dunkerque, commanded by Nathaniel Fanning have failed to appear in response to summons; and we declare the aforesaid Potter, Morin Marseille Mathe to be duly charged and convicted of having committed during the first days of last August near Cape Lizard diverse thefts and robberies aboard the Danish vessel *Emiliard*, and of having seized the keys of the trunks of several passengers on her board, and of having taken a red cape with gold braid, a costume with silver braid, a white vest, several shirts, several towels, gold-braid, a gold seal, silver, a case of liqueurs in punishment for which we condemn the said Potter to be hanged to a gallows erected for the purpose on the quay of this port and strangled by the executioner of high justice until he is dead; we condemn the said Morin and Marseille Mathe to be whipped and flogged naked by the said executioner of high justice and then branded on the right shoulder by a red-hot brand bearing the letters G A L and then conducted to the galleys of His Majesty, where they shall be made to serve during three years, their effects to be seized and confiscated to the profit of M. l'Amiral or of him to whom it appertains. Previous to confiscation the sum of 50 livres is to be deducted in payment of a fine to the admiral. Our present judgment will be executed in effigy by the attachment of figures to the aforesaid gallows and scaffold. We declare the aforesaid Nathaniel Fanning duly guilty and convicted of having failed to maintain subordination among his crew and of not having supervised that which was done during the search of neutral vessels, which gave rise to the aforesaid thefts, in punishment for which we declare him incapable during three years of any command as captain of vessels within the realm, and we enjoin him to be more circumspect for the future under penalty of the law. We condemn the said Potter, Morin and Mathe and Fanning to pay the expenses of the procedure. We acquit Jacques Cavaillé, who together with Fanning will be set free. We also dismiss Pierre Carbonnier from the accusation, and as a consequence order that the record of his imprisonment

be erased and blotted from the registers of the jail and a record of this decision be written in the margin thereof.

Carbonnier, the first carpenter, was assuredly not guilty, and it seems that the same is true of Cavaillé. The latter was a good subject. Formerly he served as an auxiliary officer aboard one of the vessels of the king under the command of Count d'Estaing and had taken part in all the campaigns, notably before St. Lucia, where he received a wound which forced him to resign from service. To gain a living he was forced to enlist aboard privateers.

On June 28, at the receipt of the text of the decision, Périer, secretary-general of the marine, wrote to the procurator of the Admiralty: "I do not believe that the condemned have enough effects to pay the expenses of the procedure. I pray you to let me know your opinion as to what may be done." This fact had been foreseen a long time before and, by the insistence of Marquis de Castries, the Admiral of France had consented to take upon his own shoulders the expenses of the prosecution. During the course of the prosecution, however, the *armateurs* failed to respond to summons made against them and were condemned for default. This was seized as a pretext to place all the burden of expenses upon their shoulders. In "expenses and restitutions" they were forced to pay 15,789 liv. 10 s. The net profit of the second cruise of the *Éclipse* was only 7759 liv. 4 s. 5 d. Thus there was another deficit to add to that of the first cruise, so that Messrs. Peychiers and Torris and investors in this armament suffered a disastrous operation.

Of all the moral lessons which resulted from the adventure it was perhaps this financial loss which most impressed them.

IV

What became of the Americans who had served as corsairs at Dunkerque, after peace was declared? Like other corsairs, most of them took service on merchant vessels, and many returned to America. Some of the captains whose records we have been able to trace in part had experiences of varying fortune.

Moses Bailey had commanded *La Charmante,* a frigate of 110 tons on a cruise which yielded 139,428 livres; later, having commanded in succession *L'Espérance* and *Le Poisson-Volant,* he retured to port empty-handed. He seemed to be a mediocre sailor. After the war he forsook the sea and maintained a drink-shop

at Ostend. Profiting from the fact that he was acquainted at Dunkerque, he came back in order to enlist sailors for the port of Ostend. When the officers of the marine learned of his mission, they had him arrested and imprisoned, and when charges against him were found to be insufficient to prosecute him before the Admiralty courts, an order from the king prolonged his imprisonment for three months [77] with hopes that during the interval some testimony would be found to convict him.

Patrick Dowling was implicated at the commencement of 1788 in one of the cases of barratry which at that time caused a stir in the maritime world. He was imprisoned on January 24. Again sufficient proofs were lacking. Dowling was freed but was condemned to pay the expenses of his trial. He made an appeal for the annulment of the condemnation.

The minister of the marine ordered rejection of the appeal in the interest of the plaintiff, saying that if the case were reopened, Dowling would run the risk of suffering a more serious sentence (February 5). The information in regard to him sent by the *ordonnateur* of the marine at Dunkerque to M. Chardon enables us to fix definitely some points in regard to Dowling:

You have come to Dunkerque often enough to know this officer as well as I. You are not ignorant of the fact that he was an English sailor to whom the *armateurs* of this port entrusted the command of a small privateer. The excellent acquaintance which he had of the English coast and of all the little inlets of that coast enabled him to take a large number of prizes without firing a gun. You should know as I do, Sir, that Dowling, although he was made lieutenant of the king's frigate and afterwards sub-lieutenant of the king's vessel, has always lived a life of the greatest debauch by passing days and nights in drinking in dens with the worst riff-raff of English sailors, to such a degree that the other lieutenants of the king's frigates at Dunkerque have never wished to have the least relations with him or even see him.[78]

As for Georges Fernauld, who was captured by the English at the end of both the cruises which he commanded, we have some information contained in a letter addressed on September 17, 1796, by Truguet, Minister of the Marine, to the commissioner-in-chief of the marine at Dunkerque:

Citizen, Capt. Georges Fernauld, commanding the American vessel, *Sally*, is guilty of an act of perfidy for which it is of importance to punish him the moment that he makes his appearance in one of the ports of the Re-

[77] Bibliothèque Dunkerque, Coppens, cart. 12, no. 5, F 1.

[78] Arch. Mar. Dunk., Letters to the court, August 13, 1788.

public. This foreigner, being met at seven lieues from Havre by four pilots who offered to aid him by their escort, refused their aid and counseled them to board a vessel which was in sight and at a distance of about one *lieue*. They hastened to do so and did not realize until they were well within cannon shot that this vessel was an English cutter armed in war. The enemy forced them to come aboard, retained them during several hours, and did not set them free before damaging their vessel considerably. If the aforesaid Captain Georges Fernauld arrives in one of the ports of your jurisdiction, you shall order his arrest and have him brought before the court for trial.[79]

The list of discreditable cases ends with this. The records of the others open to us some pages of brilliant history.

First of all is Luke Ryan, who in 1781 obtained the enjoyment of rights of *bourgeois* at Dunkerque. In 1784 he reclaimed in vain 160,000 livres which were owed him by his *armateur,* Sir Torris. When he returned from imprisonment in England, he found Torris in bankruptcy and he thus lost the larger part of all that which he had gained during the war. In 1786 he was 35 years old, having spent 20 years upon the sea. A letter from the king to the Admiral under date of January 27, 1786, mentioned the fact that Ryan had captured 80 English vessels without counting those which he had sunk, that he had captured 60 cannon, made more than 500 prisoners, and had fought through 13 combats, in the course of which he had received many wounds, and had passed three years in the prisons of the enemy. The king ordered that he be set at liberty, and as an acknowledgment of his services he authorized him to be received as "captain of vessel" and placed in command of a vessel at Dunkerque.[80]

On July 31, 1788, William Ripner received the same favor, although he did not offer sufficient justification for it. The exceptional services which he had rendered, however, were taken into account.[81] On May 28, 1793, he took command again of a privateer and sailed aboard the *Sans Peur,* a vessel of 25 tons equipped by Degravier. In August, 1795, we find him cruising aboard *Le Petit-Diable,* equipped by Hayart. He was promoted to the rank of lieutenant and took many prizes. In March, 1800, he was considered as a possible commander for *La Désirée,* one of the four frigates of the division placed under the command of

[79] Arch. Mar. Dunk., BB 2.
[80] Arch. Ville Dunk., 203 (liasse).
[81] Arch. Mar. Dunk., Annexes à la correspondance ministérielle.

Castagnier. Ripner had already asked Plucket to serve as his second, who had agreed to do so, when, at the last moment, the command of this vessel was given to Captain Plancy. Plancy was killed aboard her on the night of the 25th of June following.[82]

Among them all it was John Moultson whose fortune was the most brilliant. In August, 1783, as *armateur* he failed to place, in accordance with regulations a surgeon aboard *La Sophie,* and was condemned to a month's imprisonment. The king annulled this sentence "because he (Moultson) had already suffered misfortunes." He occupied the rank at that time of lieutenant of the king's frigate. On May 1, 1786, he was promoted to the rank of sub-lieutenant of the king's vessel. On June 6, Mercier, *ordonnateur* of the marine, wrote to de Castries in regard to him: "He is a good sailor who gave during the course of the last war proofs of the greatest courage.[83] On October 1, 1787, he was named officer of the port of Dunkerque. In July, 1790, we find him interested for a one-third share in the armament of *La Therèse,* armed by the widow P. S. Fiquois.[84] Castagnier, who was shortly to play an important part in the defense of Dunkerque against the English and who at that time was a sub-lieutenant, was also interested in this armament for one-third. The tension in the relations of France with the other European nations, and particularly with England, made one foresee that a war was inevitable. De La Luzerne, the minister sought to gain the greatest possible information of what was taking place in England, by means of smugglers and of merchants who had correspondents there, but the information thus gained was not exact. In order to have more precise news he ordered Mercier to profit from Moultson's knowledge of English by sending him to England.[85]

Moultson must have acquitted himself of this mission to the satisfaction of the government, for in December, 1792, we find him with the rank of "*capitaine de vaisseau*" and in command of a strong naval division composed of 625 men and stationed at the mouth of the Schelde. He was under the orders of Dumouriez, who commanded him to winter at Antwerp. The sailors were

[82] *Mémoires de Plucket,* Dunkerque, 1843, in 8°, p. 313.
[83] Arch. Mar. Dunk., B 2, reg. 11.
[84] Arch. Ville Dunk., 192.
[85] Arch. Mar. Dunk., BB 2, reg. 20.

hardly better equipped than the soldiers of the army, who wore *sabots* (wooden shoes). Monge, the Minister of the Marine, informed the *ordonnateur* Najac that the officers under Moultson "were in need of everything and did not have the wherewith to procure for themselves the most necessary articles."[86] Najac was ordered to send them provisions. All the letters of Monge which make mention of Moultson never fail to prefix to his name the word "brave" and to praise his activity. The following addressed to Toustain, who had just succeeded Najac, and dated April 10, 1793, should be noted:

> I have learned with much sorrow of the total loss to the Republic of the armed gun-boats and the transport-vessel which remained ordinarily at Bruges or at Ostend, and I bemoan the fact that all the zeal and diligence of the merchant officers and of the crews which you sent have come to naught by reason of the delay of General Pascal, which perhaps was insidious. I am looking forward with much satisfaction to seeing the brave Moultson. In spite of the fact that all the successes which he had planned have failed to be realized by reason of the attempt which was made to carry out projects which were planned with as much perfidy as secrecy, he deserves nevertheless the gratitude and esteem of the Republic.

In the year 1795, Moultson had the misfortune to be captured by the English, and two years later we find him still in their hands. Too noble-hearted and too disinterested to grow rich from his office, Moultson's resources had remained slender and were soon exhausted. His wife was in direst need and sought relief from the government. After he had been set free, Moultson began privateering again. Inasmuch as armaments were being made more rarely at Dunkerque, he went to Calais, where he took command, from March 4 to April 27, 1801, of the privateer *La Société* a lugger of 80 tons with a complement of 36 men and equipped by Louis Barbe. He succeeded in capturing only three prizes, two of which were recaptured by the enemy and the third netted only 34,216 francs 7 s.

Besides the names of American privateersmen which we have met with during the period of the American Revolution, we meet with those of others when hostilities break out in 1793. There is, for instance, Job Bunker, who came to Dunkerque in 1786 with the group of Nantucket fishermen to develop whale-fishing. He was in command of *Le Postillon de Dumouriez* in 1793 and of

[86] *Ibid.*

Le Sans Peur in 1805 and was taken prisoner before he succeeded in capturing a prize. Another American was Ferrey, who was in command of the *President Parker* in the years 1797-1798 and captured prizes which yielded more than 300,000 livres. Another was Thomas Huston, commanding *Le Victorieux;* still another, Victor Sparrow-Swas, who commanded in succession *Le Riboteur* (1798-1799), *L'Imprenable* (1799-1800) and *Le Clairvoyant* (1800-1801), and who captured prizes to the value of almost 800,000 livres. The capture of one of these prizes gave rise to a very strange judicial procedure which throws some light on maritime commerce. On December 24, 1800, near Texel, Sparrow-Swas captured a vessel with a cargo of wheat, *Veranderung* by name, which flew the Danish flag and was bound apparently for Lisbonne. Sparrow-Swas dissimulated his flag and took possession of the ship. When, however, Degravier-Verquere, his *armateur,* learned the news of the capture, he grew afraid that the dissimulation practiced by his captain would be discovered and that the vessel would be declared wrongly and unduly captured. In that case he would be compelled to pay a large indemnity to the injured parties. He hastened therefore to send an order that the prize be set at liberty, and he wrote also to that effect to the French commercial agent at Amsterdam. The proprietors, or the pretended proprietors, of the *Veränderung,* seeing another means of obtaining damages, did not file complaint before the French court of prizes, but did so at the Bureau of Convoys at Amsterdam, where they received authorization to seize three of the prizes recently conducted into port by *Le Clairvoyant* and named *Robert, Thomas and May,* and *Fame.* The seizures were made. Degravier pleaded the incompetence of the Dutch court but in vain. He learned that the pretended proprietors of the *Veränderung* were more concerned with appropriating to themselves the proceeds of the three prizes than with regaining possession of their own vessel, which with very small expense they could have sent upon her way. Degravier thereupon made an appeal to the *Conseildes Prises* at Paris, which declared its competence in the case and ordered the minister of foreign affairs to file protest with the Dutch government against the seizure of *Le Clairvoyant's* prizes. This action interrupted momentarily the pursuits of the claimants, but the vessels were guarded under seal and sequestered. The claimants established power of attorney to

safeguard their interests. Inasmuch as the *Veranderung* had not been declared good prize and confiscation had not been made of its cargo, which remained untouched aboard her, the damages could not have been very great. Degravier proposed a settlement for 7000 francs and a payment of 2000 in addition for lawyers' fees. He made a deposit of the sum. This was refused, however, by the claimants, who continued their vexatious procedures. They finally succeeded in carrying out the plan of renouncing their possession of the *Veranderung* and of her cargo in order to justify a larger claim for damages.

Degravier then turned against the attorney established by the claimants and after a vain attempt at settlement before the justice of the peace, entered suit against him. The attorney pleaded incompetence, but lost his appeal. In the meantime Degravier died. He had not ceased to fight against the claimants by the intermediary of the French commercial agent at Amsterdam, of Dutch ministers, of the King of Holland and of the Emperor himself, but all in vain. Of the proceeds from the three prizes, the heirs of Degravier were ordered to pay 40,719 florins 8, although the French agent entered protest. They refused to accept the rest which remained from the sale on the grounds that the procedure was unjust. Finally, in the year 1823, the affair of *Le Clairvoyant* was finally liquidated, but the proceeds from only one prize were credited to those interested in her armament. This prize was *Le Commerce,* sold at Bremen for 26,742 francs.

At the end of the Empire privateering became more and more a war carried on before the courts.

It remains for us to cite the name of Thomas Keasbery, who commanded two privateers, *Le Républicain* (1793) and *La Delle* (1798-9), and succeeded in a happy adventure. The tribunal of commerce, which after the suppression of the Admiralty courts in the new organization of the state had jurisdiction over privateering wrote on February 6, 1793, to the minister of the marine as follows:

> Citizen, The captain of the privateer *Le Républicain,* furnished with letters of marque issued this morning, and impatient because his vessel was not yet prepared to sail, equipped a large boat with himself and eight other men who were armed each with guns. He then rowed down the harbor and brought back this evening the English cutter *Betsey,* manned by a crew of seven men.

We made haste to acquaint ourselves of the duty prescribed for us by the ordinance of the marine. By to-morrow's mail we will communicate to you the details of the affair in order to have your decision. It is important to organize the court which is to supplant the ancient *conseil* in having jurisdiction over prizes.

As to the crew of the captured vessel, the captain has given bond to appear before us and the remaining six have been imprisoned. The chief among them will be questioned to-morrow on the circumstances of the capture, as the regulations prescribe.

Inasmuch as our duty is terminated when we have placed the crew of a prize in custody and taken their depositions, it is for you to order in accordance with your will the disposition to be made of the prisoners.[87]

On the morrow the judges of the tribunal of commerce wrote another letter on the same subject. It gives information on the enlistment of the crews of privateers and makes known the illusions which sailors entertained as to the benefits which would be derived from the new regulations governing privateering. The affair of *Le Clairvoyant* and many others prove that the liquidation of such affairs was as long drawn out under the new régime as under the old.

Citizen, We informed you by our letter of yesterday that the privateer *Le Républicain,* Captain Thomas Keasbery, had conducted into this port the English cutter *Betsey,* manned by a crew of eight men.

You will find inclosed in this letter the instruction and depositions which will enable you, Citizen Minister, to have judgment pronounced by the court or committee on prizes on the validity of the prize. We urge a prompt decision, the necessity for which you will understand when we say that, in the new order established, sailors expect prompt decisions. A failure to render decisions promptly would make them censure this tribunal as they did the ancient *conseil* for its long delays.

We have notified Citizen Najac, civil *ordonnateur* of the marine, of the imprisonment of the English sailors, and he has replied that in accordance with the laws he will provide for their nourishment.

The detention of English sailors gives us an occasion to make certain reflections which you might communicate to the Convention. Art. IV of the law of January 31 limits the enlistment of regularly classified sailors on privateers to one-sixth of their number. We notice the difficulty which *armateurs* are experiencing in completing their enlistments among foreign sailors. To facilitate this task, we should propose to leave to *armateurs* the privilege of enlisting volunteers among the prisoners, much the more so because there are to be found among them some Scotch and Irish who are not at all sympathetic with the English ministry. We should in that way be able to have our revenge upon the English govern-

[87] Arch. Greffe, Copie Lettres, I, 71 v°.

ment, which forced our sailors to help man its vessels during the preceding war.[88]

At the news of the outbreak of a war between England and France, President Washington commanded the observance of a strict neutrality. The French government desired that the flag of neutrals and especially that of Americans be conscientiously respected. A letter by Monge leaves no doubt on the point:

> Citizen, Being informed that certain Frenchmen have seized vessels belonging to the United States of America, I hasten to urge you to take the most prompt and most efficacious measures to suppress this brigandage, which is very compromising for French honor and good faith. You must feel how important it is for the Republic to maintain the good feeling which reigns between it and the United States and to draw tighter, if possible, the lines of a fraternal alliance with a people who, having conquered its own liberty, appreciates our principles and respects our rights. In order to insure the enforcement of measures which you will have taken in regard to the matter, you will act in concert with all the properly constituted officials, who will undoubtedly be eager to lend their aid in the accomplishment of an act which is so much in harmony with justice and the rights of man.[89]

Here, as in all former time (Vauban signals in his time the existence of the difficulty), privateersmen had much trouble in determining the nationality of the ships which they captured. Truguet, Minister of the Marine in 1795-6, sent to the armed forces of the Republic and to privateersmen the information that there were four vessels of the island of Guernsey which were navigating with false papers under the flag of the United States (Aug. 21, 1796). This practice was too widely extended for a particular warning of this nature to prove efficacious. It was well known that the English had made out a number of counterfeit American passports for vessels (September 1, 1796), and on the 16th of this same month Truguet was compelled to give the order to hold all American vessels coming from England, because their captains aided the *émigrés* to re-enter in France.[90]

The war of 1812 between the United States and Great Britain brought no privateersmen to Dunkerque. That port had at that time lost its ancient splendor. The suppression of its privileges had dealt it a fatal blow. Nothing longer attracted there foreign sailors as did the exemption from compulsory enlistment

[88] *Ibid.*, 72.
[89] Arch. Mar. Dunk., BB 2.
[90] *Ibid.*

of by-gone days. The organization of the flotilla of Boulogne contributed no small part to the diminution of the great activity in the port. The *armateurs* of Dunkerque made their equipments very frequently elsewhere, as at Ostend, Flushing, Dantzig and even in Sweden and Norway.

Shortly afterwards, when Louis XVIII was restored to the throne of France, if the Americans had had the desire to arm privateers, the French government would have forbidden it. The commissioner of the marine received formal instructions under date of May 23, 1814, as follows:

Sir, The fact of the suspension of hostilities between France and England puts an end to the permissions to American privateersmen to enjoy all the advantages which were granted them in our ports during the time when we were at war with Great Britain as they are now.

Inasmuch as our relations with both powers should be in conformity to the rules of strict neutrality, His Majesty commands the following:

1. During the entire course of the war between Great Britain and the United States of America no vessel shall be armed in the ports of the realm for the account of either belligerent.

2. No French subject shall take an interest in any of their armaments.

You will please make known immediately these intentions of the king in all the ports of your jurisdiction and have the present letter enregistered at the bureau of inspection. (Signed) Malouet.

The second letter from Malouet read as follows:

Sir, In a letter of this date I notify you of the intentions of the king concerning the neutrality which is to be observed during the war between Great Britain and the United States of America.

His Majesty is not content to allow English and American armaments to be made in the ports of the realm and in prohibiting his subjects from having a share in the armaments of these nations.

In order to establish more clearly the obligations and duties of this neutrality, to prevent claims against the French by either one of the beligerents and to determine the time and the means of establishing the principles governing prizes which might have been or may be conducted into the ports of France by English or Americans, the following intentions of the king are hereby made known:

1. No vessel of the said powers shall sail from the ports of the realy before having given assurance that it will not attack vessels which have already been signaled or which are in sight or which will have sailed from the same port within the last twenty-four hours.

2. It will be permitted to armed vessels of the two belligerents to seek refuge, even with their prizes, in the ports of the realm, whenever accidents of the sea or care for their safety or other interests force them to seek such refuge.

3. The sale of prizes conducted in our ports by the belligerents is hereby temporarily defended.

These orders, Sir, may later and at a more suitable occasion be published, but for the moment it is sufficient that they serve merely as a guide of conduct for officers of the marine.

Thus you will be pleased to communicate a copy of the present dispatch to the administrators of the ports of your jurisdiction and command them not to publish it but to conform their conduct nevertheless to its provisions. Consequently, whenever an English or American ship of force makes ready to sail from the ports, the officer of the marine in a most civil manner, shall require the commander to give assurance not to attack a vessel of the enemy in a situation described above in the orders of the king. No officer can refuse to give such assurance, because the demand for it is based on the respected principles of neutrality and on the desire to observe them with the most scrupulous exactitude.

In every case arising an account shall be rendered me of what has been done.

Whenever English or American armed vessels take refuge in our ports or when they conduct their prizes thither, they should be admitted without any difficulty and I shall be informed exactly of the fact.

As to the suspension of the right to sell prizes belonging to the belligerents, the minister of foreign affairs has communicated the intentions of the king to the minister of finance.

The present letter shall be registered at the bureau of inspection. (Signed) Malouet.[91]

At this moment French public feeling, exhausted by the din of battles, courted peace. The fire of enthuiasm which had forced the hand of Louis XVI in 1778 had been extinguished by the torrents of blood which had been shed by the nation upon all the battle-fields of Europe throughout 25 successive years of formidable warfare. A general peace was concluded in 1815.

As a souvenir of the sojourn of the Americans at Dunkerque who were privateers from every State of the Union and whale-fishermen from Nantucket, one of the quays of the port guarded for a long time the name, *Quai des Américains.* The name has now disappeared.

The time has long since come when the two great Republics, by the erection of monuments in public squares, have hallowed the memories of their brotherhood-in-arms of by-gone days. It has seemed to us that the memory of the events which have been recounted above deserved to be rescued from the dust of archives. They form but an episode in the great march of the nations, but they contain their share of instruction. They reflect their ray of glory.[92]

[91] *Ibid.*

[92] Raymond de Bertrand, *Le Port et le Commerce Maritime de Dunkerque an xviii^e siècle,* Dunkerque, 1864, in 8°.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HISTORY OF ENGINEERING COMPETITIONS IN THE NAVY.

By Lieut.-Commander E. C. KALBFUS, U. S. Navy.

It is probable that two naval vessels never made a voyage in company without their coal consumption becoming a topic of conversation and a basis for comparison. Except in cases where the discrepancy was so great as to lead to an official investigation, the comparison never amounted to much, after the noon signals were hauled down. Sometimes excessive expenditure was attributed to inferior workmanship or poor design; sometimes to poor coal, or to foul bottom. Rarely was it assigned to methods of operation. The machinery of our vessels was generally in good condition. Generally, leaks were looked after and stopped, but not to the extent that is now the case. A vessel became known as a "good steamer" or a "poor steamer" and, except in a few isolated cases, she remained what she was at first.

Not so very long ago it was rare for a vessel to make her contract speed after having been in commission for two or three years. Runs at high speed were sometimes held; the measure of results was the relative position of the vessels at the finish. No particular pains were taken to definitely determine the state of engineering efficiency on board a certain vessel by comparing a recent performance with one made in the past, or to cast about for reasons for failure, except to lay it to "leaky condenser," "hot rod," etc. There did not exist a desire on the part of the personnel of the average vessel to run at full power in order to demonstrate that all the details required for a successful outcome had been carefully attended to. And such a desire was not encouraged, for the importance of engineering as affecting battle efficiency was either not understood or was neglected.

At the time that gunnery received its powerful impetus, the upkeep of machinery was receiving considerable attention, but refined and systematic methods of operation were the exception rather than the rule.

'It is known that certain engineer officers paid the strictest attention to the prevention of waste of fuel and oil, kept the joints tight, and the engines carefully aligned. The organization of their departments was good, and all known contingencies were provided against. This was all the more creditable, because the efforts were individual; there was no encouragement, and no incentive other than pride.

The results of refined methods caused by the introduction of competition in gunnery were so astounding that the application of similar methods to engineering became an occasional topic of discussion. Various estimates were made as to the saving in coal that might be effected if the same sort of attention was paid to firing the boilers as was paid to the loading and pointing of the guns. Nothing definite was formulated for some little time to come; there was no encouragement.

There have been many instances of vessels successfully making long runs because of particular care being paid to cutting down the coal consumption. Where it was at all doubtful whether the destination could be reached, the personnel was generally placed on a water allowance which, of course, resulted in a marked reduction in coal expenditure. This is a military measure, and can always be resorted to at the expense of comfort, which, in time, affects efficiency. It can scarcely be called a refined method of operation. Sometimes, the watches were placed on a coal allowance; unless the allowance is very liberal, this frequently fails of its purpose.

Cases are known where unofficial ships' competitions were instituted between watches in port, various rewards, such as extra liberty, etc., being held out as inducements to save coal. This was undoubtedly a step in the right direction. But it was still individual effort.

The date of August 22, 1906, Lieut.-Commander I. V. Gillis pointed out, in a letter to the department, the benefits to be derived from placing the personnel on a competitive basis. Among other things this officer said:

> Care of machinery is one thing, and its management another; it is in the latter that we are far behind what we should be.

It is suggested that all this important duty be taken up by the fleet engineer, and that this officer be relieved from duty as senior engineer officer of the flagship, in order that he may be entirely free to devote himself to the economical running of the machinery of the various vessels, and prepare the necessary instructions for issue to the ships of the fleet.*

It is thought that the methods that have proved so successful in the case of gunnery might be applied to engineering with equally good results. Establish competitive tests and trials, with trophies and prizes for the best ships. Such trials should include those for economical coal consumption, as well as for speed.

The question of economical coal consumption is an important one for it results not only from the proper firing of the boilers—a question of training of the firemen—but also from the maintenance of the machinery in proper condition.

It is believed that many matters such as the firing, gas analysis, coal analysis, proper number of boilers to use under different conditions, proper cut-off, tightness of main engine valves and pistons, temperature of discharge water, temperature of feed water, tightness of steam and exhaust joints, use of half-burned ashes, etc. are not being given the attention they should, and although a careful scrutiny of the steam logs might bring about the issuing of instructions along the line of economical management, it is thought that proper attention to this matter can best be given by the officers of the ships who are more closely in touch with it.

An attempt has been made on recent trials to use proper system of firing and also in some cases, to analyze the funnel gases, but with the exception of a possible ship or two, nothing has been done in the navy at large.

At this point it should be noted that most of the causes of waste of coal were well known, but that proper attention was not paid to their elimination. Gas analysis has since been employed to a considerable degree, and ships' competitions between watches have been instituted, the amounts of CO_2 being published weekly.

Lieut.-Commander Gillis further says:

It is believed that the assumption may be made that at least one-third of all the coal used is burned under conditions that permit of economy if proper attention is paid to details.

Not only will there be a saving of money for coal, but it must necessarily result that the greater care given machinery will reduce the cost of repairs to engines and boilers as well as to make them last longer.

. . . . the details would have to be carefully worked out and, no doubt, would require extensive modification from year to year as more was learned about the subject, as has been the case with the question of gunnery.

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* When the Atlantic Fleet began its cruise around the world, the fleet engineer was, in addition, the senior engineer officer of the fleet flagship. It was not until after the fleet reached San Francisco that the duties of the two positions were made separate.

It is understood that, in the near future, four armored cruisers, sister ships, are to proceed to Asiatic Station via Suez Canal. This voyage is of about 13,000 miles, with several runs of 1000 miles or more. It would seem that no finer opportunity could be had for inaugurating the scheme as outlined above, and it is thought that every endeavor should be made to take advantage of it, and for this reason it is earnestly recommended that an officer may be detailed at once to take up this subject and to proceed with the squadron on this cruise.

As far as can be ascertained after careful inquiry, no such scheme was put into effect during the voyage of the armored cruisers to the East.

On November 22, 1907, Lieutenant J. H. Tomb submitted, in a letter to the department, a definite set of rules for competitions for battleships and armored cruisers, cruisers, monitors, gunboats, torpedo vessels and submarines. These rules were drawn with the idea, as stated by the author, of "increasing the speeds of the vessels in commission," and the award of trophies was recommended. These rules required vessels to run at full power and to standardize. Torpedo vessels were penalized for torching. It was further stated that:

The effect of this competition on the training of the personnel of the engineer's force on each vessel will be excellent, as the fire-room and engine-room crews will have more of an incentive to do their best. A better study will be made of firing, backed by the enthusiasm of the fire-room crews, and better systems of firing will be evolved, due, principally to the interest the fire-room crews would take in obtaining results.

The results of such a system would become apparent immediately upon its adoption. An officer's reputation would depend upon getting speed, and would not permit laziness.

The rules submitted by Lieutenant Tomb covered not only the details of the trials, the appointment of umpires, etc., but gave, in detail, methods for computing the points made by each vessel for the establishment of final standings.

In December, 1907, the Atlantic Fleet started on its voyage around South America. There were plenty of sceptics who prophesied that the fleet would not reach the coast of California intact. This feeling was not shared generally by the officers of the fleet, but it must be confessed that it looked as though the chances were against the entire sixteen arriving at the same time. There were long runs to be made, repairs had to be effected on board, and coal economy was imperative; the voyage was to be more of an engineering feat than anything else.

At Rio de Janeiro, Brazil, in January, 1908, Rear-Admiral R. D. Evans, commander-in-chief of the Atlantic Fleet, issued a Fleet General Order, instituting an engineering competition for battleships, and a separate competition for destroyers. This is believed to be the first instance of the establishment of engineering competitions for several vessels, under definite rules. If there were other cases before this their effect was neither general nor lasting.

This General Order stated that:

> . . . . the efficiency of any vessel in battle is based, not only upon the performance of her battery, but also, to a very large extent, upon that of her engines and their appurtenances.
>
> . . . . her value as a strategical unit is directly dependent upon her economical use of such amount of coal, oil, and other similar supplies as it is possible for her to carry.

The competition for battleships combined the features of development of maximum speed under both forced and natural draft, economy of coal and oil under these conditions, and economy of coal under ordinary cruising conditions, at moderate speeds. Breakdowns in formation were penalized.

The destroyers were required to compete in maximum speed and economy of coal and oil at maximum speed, and in economy of coal and oil at cruising speeds. Torching at night, while running at high speed, was to be penalized.

The standards of economy were the performances while en route from Hampton Roads to Rio de Janeiro. Water received from an outside source was charged as coal at the average rate that it cost to distill aboard ship, and gain or loss in water between the time of beginning and ending the competition was credited, or charged, as coal at this rate.

As the vessels had all been docked at about the same time, and as they were constantly together and consequently encountered the same weather conditions, it was a simple matter to compare the coal economy of the several vessels. Interest in the scheme was at once apparent.

The competition ended at Magdalena Bay. The distance steamed was 8210.5 knots, and a total net increase in economy of 1460 tons of coal was realized. As there was no time for holding the full-power trials, no award was made, but the commander-in-chief, in a Fleet General Order, congratulated the officers and men of the fleet "on the interest they have shown in the matter

and on their zeal in endeavoring to increase the efficiency of the ships in this particular . . . . "

The commander-in-chief said, further:

. . . . we have placed the scheme on a good working basis and have secured satisfactory data on which to base a positive award next year. That so much has been accomplished and that general interest has been created in the work is believed to be a matter of great satisfaction to us all. The commander-in-chief hopes that this interest will continue, as has the general zeal in gunnery brought forth by similar methods. The commander-in-chief is glad to announce to the officers and men that the Navy Department has expressed its full approbation of the system, ...

On June 28, 1908, at San Francisco, the new commander-in-chief, Rear-Admiral C. S. Sperry (whose fleet engineer was the present engineer-in-chief of the navy) issued a General Order continuing the competition and publishing the rules therefor. The factors remained the same, but a factor encouraging economy of lubricating oil at cruising speeds was added.

On the long run from Honolulu to Auckland the saving in coal was so marked as to cause the commander-in-chief to issue a special order in which the figures were published. The run covered 16 days of steaming, and the average saving per day (neglecting the last day when speed was materially increased and head seas were encountered) was six tons per ship. The total saving for the run was 2185 tons. It was remarked that unfavorable influences to economy of coal had been shown to be: stopping with all boilers steaming, a heavy head sea, and increase of speed.

The following cablegram, sent while the fleet was at Albany, West Australia, explains itself:

Navigation, Navy Department, Washington.

For *Equipment:* Reduce estimate coal required Colombo from twenty-three to eighteen thousand tons, Negro Bay from twenty-four to twenty-one thousand tons, revised estimates rendered necessary by decreased consumption shown since leaving San Francisco. Fleet sails eighteenth.

Sperry.

This period of competition ended in Manila Bay, the *Wisconsin* being declared the winner. The distance steamed was 13,155 miles, and the total saving in coal, as compared with the performance on the run from Rio de Janeiro to Magdalena Bay, was 2425 tons. The most remarkable showing made was in economy of lubricating oil, 8153 gallons being saved. Two of the ships

more than doubled their cruising radius, as far as oil was concerned.

The competition was again put into effect on leaving Manila, and, except for the period during which the divisions dispersed in the Mediterranean, continued until the fleet reached Hampton Roads. On account of the long time out of dock, the vessels were foul, and the fouling was unusually heavy because of the stay in Manila Bay. In spite of this, and in spite of the bad weather encountered while crossing the Atlantic, the saving in coal, compared with the performance from Hampton Roads to Rio de Janeiro, amounted to 5.6 per cent.

The saving in oil was more remarkable than at first; in fact, it is believed that one or two ships about reached the limit in this respect. 6269 gallons were saved over the performance from San Francisco to Manila, which means that 14,222 gallons had been saved over the performance on the voyage around South America. Several vessels had demonstrated that, with only their regular tank capacity, they could make the entire voyage around the world, via Australia, and still have oil left in their tanks on their arrival home.

It is useless to speculate as to the outcome if the voyage around the world had been made without competition. It was freely predicted, before the voyage began, that a trail of broken-down battleships would mark the course from Hampton Roads to San Francisco. As the break-downs that were to afford this humiliating spectacle could have referred solely to machinery casualties, it can be inferred that the state of efficiency of the engineering branch of the navy was under grave suspicion in certain quarters. The fleet actually made three times the mileage that was involved in the cruise around South America, and adhered to a schedule of dates of departures and arrivals almost without a break.

It is natural, perhaps, that a voyage of this character should develop the resources of the ships, and tend to force them to be self-supporting. And natural, also, that there should be a saving of fuel and oil, due to continued practice in running the machinery, and firing the boilers. How much of the actual improvement was due to the voyage, and how much to the competitions, can never be ascertained. But previous voyages, of considerable length, had failed to produce a proportionate amount of improvement.

The saving in oil was almost entirely due to competition. Although the run from Rio de Janeiro was made with economy of coal as one of the factors of the competition, economy of oil was not encouraged by the rules, and it is a noteworthy fact that no saving in oil was effected on this run. It was a bold stroke to place a premium on cutting down the oil consumption of a high-powered vessel, but the new rules, issued at San Francisco, did this very thing. It was pointed out that cruising radius depended on coal rather than on oil, and that there was no real economy in burning up bearings to save a few gallons of oil. But competition started the engineers to experimenting carefully, with the result that the vast quantity of oil that had hitherto been splashed on the floor plates, and pumped overboard from the bilges, was left in the tanks for future use. There were scarcely enough hot bearings during the entire voyage to make the matter worth mentioning; there were no more after leaving San Francisco than there were before.

An engineering competition in the Pacific Fleet was instituted shortly after the Atlantic Fleet left San Francisco. Performances during a voyage of over 9000 miles, ending in November, 1908, showed marked improvement on the part of the eight armored cruisers, and, after the completion of the voyage the competition was again put in force.

On the first day of July following the return of the Atlantic Fleet to home waters, the Navy Department directed that the first official engineering competitions begin. The drawing of rules, the computing of standings, and the publishing of results, were entrusted to the director of target practice and the two great factors of battle efficiency, gunnery and engineering, became identified with each other from this time on. The rules were made confidential, as it was recognized that methods having the greatest bearing on battle efficiency were being developed because of competition.

The third official competition is now in progress. Battleships and armored cruisers, cruisers, destroyers, and submarines now compete during each fiscal year, and handsome bronze trophies are awarded annually for superiority in the different classes. The deserving members of the engineer's force of trophy-winning vessels wear, throughout the year, a red "E" on the sleeve, and the trophy-winning vessel is distinguished by a red block letter

BATTLESHIP ENGINEERING TROPHY.

"E" on the after smoke pipe. In addition, the vessel receiving the highest combined final merit for gunnery and engineering is awarded the battle efficiency pennant, the greatest distinction that a vessel can receive.

For the year 1909-1910, the *Nebraska* was declared the winner in the battleship class, and the *Preble* in the destroyer class. For 1910-1911 the *North Carolina* was the winner in the battleship class; at this writing the scores of the other classes have not been computed. Reports, however, indicate that the competition for submarines, first instituted October 1, 1910, caused these vessels to perform an amount of surface, submerged, and awash work, hitherto unheard of.

The *Michigan* was awarded the battle efficiency pennant for the year 1910-1911, and with this distinction went a commendatory letter from the President of the United States. The captain and nine other officers of the *Michigan* had copies of this letter placed on their records, as a testimonial to the fact that they were directly responsible for making the *Michigan*, "with the material at her disposal, the most efficient battleship in guarding the country's interests."

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A NOTE ON SALVO DISPERSION.

By Ensign Garret Schuyler, U. S. Navy.

As modern long-range salvo firing is of such comparatively recent origin, it is not surprising to find that in treatises on the accuracy and probability of gun-fire there is little or no mention of the now important questions of the effects of salvo dispersion, the dispersion of maximum efficiency, and how this compares with dispersions actually obtained in practice.

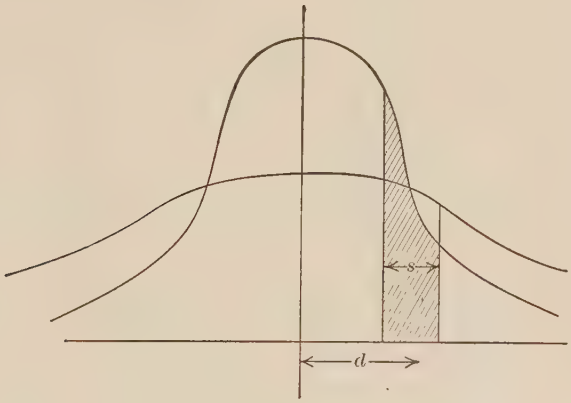

Fig. 1.

If we consider the center of the danger space s at a distance d from the center of a salvo, and draw ordinates (Fig. 1) to represent the distribution of the impacts, then the shaded area included between ordinates limiting the danger space will represent the number of shots hitting the target, while the whole area of the curve represents the number of shots in the salvo. This shaded area showing the number of hits can be the same in the case of a high but steeply descending curve representing a well-bunched salvo as in the case of a lower but less steeply descending

curve of equal area representing a more scattered salvo with center in the same place. Thus, in general, there are two values of the mean dispersion corresponding to a given percentage of hits on a target of danger space s by salvos striking with centers d distant from the center of the danger space. (For instance, as an extreme, zero hits can be made either by bunching off the target infinitely well, or by having infinite dispersion.) Intermediate between dispersions too great and dispersions too small, giving the same percentage of hits in danger space s when the salvos land d distant, there is one particular value for the mean dispersion that will give a better percentage of hits than can be obtained by using any other value for the mean dispersion.

We will call this γ_{max}, the "dispersion of maximum efficiency," and will calculate its value.

On page 129 of Alger's Exterior Ballistics is a table of "probability of a deviation of less than a," P, the probability, being given for different values of $\frac{a}{\gamma}$ where γ is the mean dispersion. Using this formula, the percentage of hits is

$$P\left(\frac{d+s/2}{\gamma}\right) - P\left(\frac{d-s/2}{\gamma}\right) \quad \ldots \quad 1$$

and using $d=200$, 500 and 1000 yards, and $s=60$ and $s=120$, we get by repeated trials in picking out successive values of γ till we locate values of γ_{max} corresponding to maxima in P_1 as follows:

d	γmax	P	d	γmax	P
200	.160	.073	200	.155	.015
500	.420	.030	500	.385	.058
1000	.825	.015	1000	.770	.029
	$s=60$			$s=120$	

These results show that for all usual values of s, and for salvos within 1000 yards of the center of the danger space, we can say, with an error of less than about 3%, that *the dispersion of maximum efficiency is equal to* $\frac{4}{5}$ *the distance from center of salvo to center of danger space* (also P can never exceed $\frac{1}{4}$ of $\frac{s}{d}$).

Now, interesting ourselves in the "Report of Observers" for one ship's day battle practice, we have as follows:

	s	d	γ
12″	120	144	42
8″	120	242	38
6″	140	139	93

The fact that the average value of γ is less than $\frac{4}{5}$ of the average d suggests the possibility that if there had been more dispersion the score would have been higher. As this is a little unexpected, it may be well to investigate the firings in detail, calculating P for each salvo, and then calculating it again with a value of γ assumed as $\frac{4}{5}$ of the average d for that caliber.

12″	s=120		4/5d=120	8″	s=120		4/5d=194	6″	s=140		4/5d=112
Distance from center of danger space.	Mean dispersion.	Probability of hits.	Probability with 120 yds. assumed dispersion.	Distance from center of danger space.	Mean dispersion.	Probability of hits.	Probability of hits with 194 yds. assumed dispersion.	Distance from center of danger space.	Mean dispersion.	Probability of hits.	Probability of hits with 112 yds. assumed dispersion.
d	γ	P_γ	P_{120}	d	γ	P_γ	P_{194}	d	γ	P_γ	P_{112}
7	17	.993	.310	427	22	.000	.044	97	122	.293	.307
−147	262	.133	.198	435	25	.000	.040	45	165	.259	.365
−110	0	.000	.239	127	48	.132	.171	−195	150	.176	.157
15	25	.916	.309	110	25	.056	.180	−187	103	.159	.167
−160	25	.001	.182	85	100	.297	.185	− 03	73	.556	.383
− 35	0	1.000	.302	− 48	62	.479	.191	−100	93	.327	.302
102	62	.275	.250	− 72	32	.881	.189	150	74	.186	.226
−385	0	.000	.014	197	16	.000	.141	222	83	.071	.124
−310	42	.000	.042	572	46	.000	.013	280	37	.000	.052
−185	25	.000	.152	435	36	.000	.040	172	67	.111	.192
−185	0	.000	.152	310	36	.000	.088	114	58	.261	.283
				280	25	.000	.096	108	100	.310	.286
149	42	.303	.182	172	54	.050	.151				
				135	00	.000	.166	139	93	.225	.237
				225	37	.000	.128				
				242	38	.093	.121				

From the above it is plain that in the case of the ship in question greater dispersion *would* have raised the score for 8″ and 6″, but not for 12″.

Granting that one dispersion is more efficient than all others, we may inquire how much more efficient it is. For instance, if a salvo lands 500 yards from the center of the danger space we know 400 yards mean dispersion gets the greatest number of hits. What percentage of that number will be obtained with a mean dispersion of 200 yards, or 800 yards, etc.? Let $d=100$ yards and $s=60$ and 120 yards, then from the above we judge the form

γ Mean dispersion.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.
	$s=120$	$s=60$
80	1.00 %	1.00 %
160	.72 %	.71 %
240	.52 %	.51 %
400	.32 %	.32 %

of the function to be fairly constant. By plotting on a large scale we get the following results:

Mean dispersion expressed as a per cent of distance of salvo off target.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.	Mean dispersion expressed as a per cent of distance of salvo off target.	Probability, as percentage of probability obtained with dispersion of maximum efficiency.
% γ/d	% $P/P\,max$	% γ/d	% $P/P\,max$
10	.02	90	.98
15	.04	95	.96
20	.06	100	.94
25	.10	105	.92
30	.20	110	.90
35	.36	115	.88
40	.52	120	.86
45	.65	125	.84
50	.77	130	.82
55	.83	135	.80
60	.89	140	.78
65	.93	145	.76
70	.97	150	.74
75	.99	155	.72
80	1.00	160	.70
85	.99		

The results quoted above being from but a single ship cannot be generalized on too far and taken as representing all ships, but since the scores were perhaps closer to average than to either best or worst it is surely not unreasonable to suppose that there are other cases like this one where more dispersion would have meant more hits.

Whether to increase the dispersion would or would not harm the score cannot be merely a general matter of opinion or mere prejudice against any dispersion at all, *per se,* but must be judged in different cases according to the different values of d and s and γ in these instances.

The claim is quite commonly made that to bunch a salvo always helps the score because it makes spotting easier. Unmodified, in this form, this is merely an unsupported statement of an opinion hardly applicable to all cases. For considering all the elements of spotting and range keeping it is by no means to be taken as axiomatic that the spotter will profit from the decreased dispersion and get a decrease in mean distance from the target sufficient *in every case* to more than overbalance the disadvantage that decreased dispersion might handicap him with.

Just what the best dispersion is for a single salvo is easy enough to decide. We have seen it to be $\frac{4}{5}\ d$. It does not follow, however, that for a series of salvos, the best results will come from making the mean dispersion in every salvo equal to $\frac{4}{5}$ of the average value of d. To state this as it is frequently heard, "The one or two bunched salvos that might get on the target would count so much when they *did* hit, that to disperse all salvos more, even though perhaps helping in all other salvos but the one or two hitting, might or might not pay in the long run." Trial and error is the only practical method of determining the dispersion of maximum efficiency for a series of salvos, but there *is* a dispersion of maximum efficiency not zero, and the whole point of this article is to bring this to mind.

No wild scheme of purposely bore-sighting to disperse is suggested from this limited amount of data. No general denial is made of the merit as a working principle of the current idea of trying to "bunch the shots" in the salvos. It is merely suggested, however, that there are occasions when both sides of the matter should be understood.

For instance, if ever from the results of a whole target practice we should decide that the mean dispersion was as small as, or smaller than, the dispersion of maximum efficiency, would it not be appropriate that the following year's rules put a greater premium on rapidity of fire (with its accompanying increase in dispersion)?

Suppose again that the question came up of rebushing trunnions of turret guns because it was feared that the wear in the bearings had caused errors that would make dispersion. Would not it make one go a bit slow in spending thousands of dollars on the job, taking out guns, face plates, etc., to realize that the increased accuracy might prove harmful?

When guns have been fired till it is feared some dispersion may result from their bores being worn, the question of relining comes up. Shall we pay $10,000 per gun for decreased dispersion or is it not worth it? Or might it not be detrimental to fighting efficiency as well as expensive, to cut down the dispersion by putting in new lines? At what stage should the guns be relined? These and similar questions are all involved in this matter of the effect of salvo dispersion, and their importance seems to justify the systematic collection of data and their further study.

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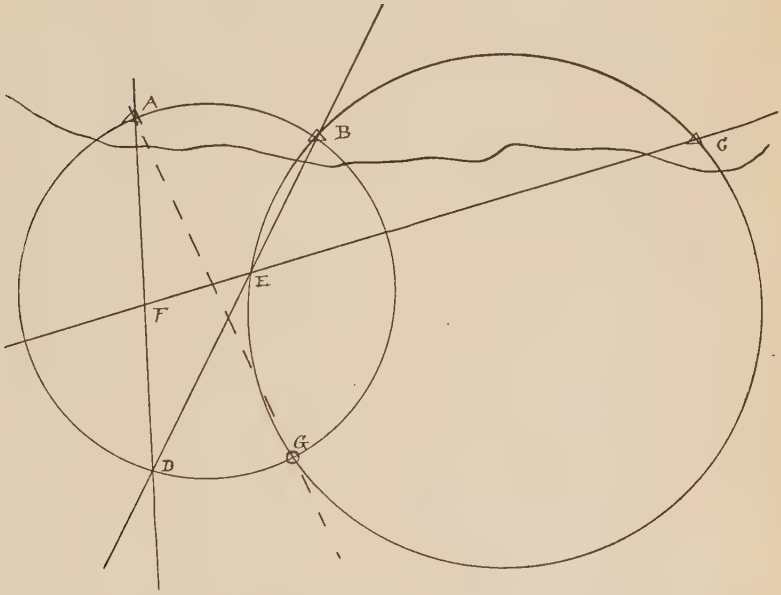
WHEN PLOTTING THREE BEARINGS AND THEY FAIL TO CROSS IN A POINT.

By Commander G. H. Burrage, U. S. Navy.

There is a very general idea that when plotting three bearings and they fail to cross in a point, that the probable position is the middle of the triangle so formed, and that an error in one bearing has probably been made.



Taking an exaggerated case, *A, B* and *C* being points on shore, *DA-DB-EC,* the plotted bearings forming the triangle *DEF.*

Consider the bearings taken as representing horizontal angles, then a circle through *ABD* will give all possible positions of *D.* A circle through *BCE* will give all possible positions of *E.*

The point of crossing of the two circles at *G* will be the position required, and the angle *DAG* will be the compass error that should have been applied to each of the bearings so that they would cross in a point.

An inspection of the triangle will easily give the intersection without actually drawing the circle.

When the bearing of the center object cuts to the right of the intersection of the other two bearings, the position is to the right of the triangle; and when it cuts to the left, the position is to the left of the triangle.

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SOME CONSIDERATIONS AFFECTING THE NAVY PERSONNEL.

By Captain Roy C. Smith, U. S. Navy.

There seem to be several shades of service opinion in regard to personnel measures, varying from indifference, if not opposition, to passive sympathy, and finally to active support. This is not unnatural. We are all anxious for the good of the service, but we would rather have that good tend in some way to our own welfare as well. We are perfectly sincere in this, and we cannot help scanning proposed measures to see how they are going to affect us in this regard.

The personnel bill introduced in the last session of Congress has the intention of promoting the good of the service. If any of its features do not promise to accomplish this end, they ought to be modified. Also, the good of the service has been made to include, as far as possible, the good of the individual. This is the point that has given rise to doubt in some instances, and is the foundation of most of the objections that have come to the notice of the writer.

The line personnel may be divided generally into three groups; first, those who were in the service before and were not affected by the legislation of 1882; second, those who were affected by this legislation, and those following them down to the present large classes; third, the present large classes, beginning with the class that entered in 1903.

Among the first group there is little opposition to the measure, so far as is known. For a year or two there would be a ten per cent elimination from the grade of captain, which would then cease for a dozen or more years; and there would be a continuous fifteen per cent elimination from the grade of rear-admiral *This amount of elimination is less than by existing law,*

and will be very materially less when the eliminations cease in the grade of captain, that is, in a year or two. There are also other advantages; voluntary retirements take place at any time during the year, and captains of over thirty-seven years' service retire as rear-admirals.

These provisions will bring officers to flag rank continuously by the age of fifty-five years. The statement is sometimes heard that we have flag officers now as young as fifty-six, and that they will continually get younger; that captains now being promoted have passed through the grade of captain in four years, and as captains are now reaching their grade at the age of forty-eight, they will be rear-admirals at the age of fifty-two. The trouble with this line of reasoning is that the time of reaching the grade of captain has no necessary connection with the time of reaching flag rank. If eighteen rear-admirals are allowed, and the classes at the top of the list average nine members, it is obvious that flag officers will average two years in their grade (eighteen divided by nine equals two). Similarly, if the classes average six members, they will spend three years in the grade, and so on. Hence, the only considerations affecting the time of reaching flag rank are the number of flag officers allowed and the size of the classes at the time in that rank.

A glance at the Navy Register will show that the present classes at the top of the list average three to four members, which explains the fact of some of the present flag officers having five or six years to serve. But the classes of 1876 to 1879 inclusive average about ten members; so when these classes are reached, we shall be right back to the old conditions, that is, flag officers having only a year or two to serve before retirement. Any officer may form an estimate of the time he is apt to spend in flag rank by consulting the Navy Register and considering the size of the classes immediately preceding his own.

The officers of the second group are generally indifferent to the measure. The earlier classes were depleted by the legislation of 1882, which has given all the group rapid promotion. Present conditions being entirely satisfactory, they are content to let the future look out for itself. They do not like the graded retirement features, which they consider unfair and a violation of an implied contract. When shown that these graded rates would probably not affect them, but only the third group, they say they

are not objecting for themselves, but as a matter of principle. It is a pity that because they are satisfied with the present they will not have an eye for the future as well.

The third group might be subject to graded retirement in ten to fifteen years, depending on the growth of the navy. *No complaint is heard from this group.* They realize that promotion for them under existing conditions is hopeless. The only method for any of them to be promoted in any reasonable time is for some of them to retire. Generally speaking, *they are willing to take their chance* on graded retirement since they realize that without some such plan they will spend their lives in the lower grades.

There remains something to say about vested rights and implied contracts, as well as the general fairness of the graded rates. Implied contract means that when an officer enters the service he is to be promoted in time to all the grades, barring misconduct, and is to be retired eventually on three-fourths pay. An officer who has served for some length of time under this implied contract acquires vested rights. It is not necessary to decide whether such a contract and rights really exist. It would be to the security of the individual, certainly, if they did exist; and it is desirable to continue to uphold them.

If they do exist, they have been violated in the existing personnel law, in retiring officers in advance of sixty-two years of age. Retiring them at graded rates of pay less than three-fourths of full pay would similarly be a further violation of such rights. The question now is whether such a violation, if it is a violation, is for the best interest of the whole service. If it is for such best interest, there is a precedent for it in the existing personnel law, and the matter of implied contract and vested rights may be left just where it stands at present.

It may be assumed that Congress will not authorize any law that increases the cost of the navy. If reasonable promotion is to take place, there must be some form of early retirement. If such retirements are at three-fourths pay, the cost of the navy will be materially increased. The graded rates of pay of the proposed personnel bill do not increase the cost of the personnel, number for number. Hence, graded rates seem to be the only recourse. The other alternative is to leave things as they are now, that is, to do nothing.

As to the abstract justice of the rates, the lowest rate is thirty-three per cent of $3900, that is $1287, after eighteen years' service. From this rate there is a gradual increase to three-fourths pay. Is $1287 a year too little for a man averaging thirty-five years of age and the first of his time and date whose services can best be spared with the least loss to the government? In natural justice, it is evidently liberal. It is, of course, not three-fourths pay, but that is going back to vested rights. If the officers who will be the ones to be affected, that is, the third group as above described, are willing to take their chances for the sake of the evident advantages to those who would remain in the service, then it would not seem that the second group, who only want to be let alone, have any just cause of complaint.

This matter of graded pay may be looked at from another point of view. Retirement pay is not pay at all in the sense of remuneration for services currently rendered. It is really a pension for services previously rendered. This has been upheld by the courts in a number of instances. The rate of pay actually received at the date of retirement may or may not be a measure of the whole service previously rendered, but the total pay that an officer has received during his whole service would be a just measure of such service. If each officer, under this assumption, were to be informed that hereafter an amount equal to fifty per cent of his pay for each year of his whole service would be set aside and paid him on retirement, he probably would be extremely satisfied.

Examining the graded rates of the bill from this point of view, the steps would be to compute the total pay of each officer from the date of graduation (when his real service begins) for each year up to the age of sixty-two years. Next, the graded rates regarded as an annuity would have to be capitalized. It will not be necessary to assume a rate of interest for this, as a comparison is all that is wanted. The annual pay multiplied by the expectation of life at the date of retirement will give the total amount to be paid.

Having made these computations, it will be seen that a rear-admiral of the upper half, retired on three-fourths pay at the age of sixty-two years, will receive forty-three per cent of his total previous pay on the active list, and that rear-admirals of the upper half retiring in advance of sixty-two years will average

fifty-five per cent of their previous pay. Similarly, rear-admirals of the lower half will average sixty-one per cent of their previous pay. Captains, most of whom will have served over thirty years and will be drawing three-fourths pay, will average eighty-one per cent. Commanders under the graded rates will average ninety-nine per cent. Lieutenant-commanders will average one hundred and six per cent, and a lieutenant-commander of eighteen years' service will receive one hundred and fifteen per cent.

Hence, from this point of view, the graded rates are liberal in the extreme, and most liberal in the lowest grade to the officer of the least length of service of any to be retired under the operation of the law.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CHECKING-IN.

WITH SPECIAL REFERENCE TO SHIP YARDS.

By Asst. Naval Constructor R. D. Gatewood, U. S. Navy.

One of my workmen the other day made this remark to me: "I've worked in 14 different plants and I never saw two alike when it comes to checking-in," and the surprising thing is that he may work in 14 more and his remark will still hold good. There has probably been as much thought expended over this matter of "checking-in" as over any other single detail common to all plants, and the number of systems in use is a remarkable tribute to the diversity of human opinion and the ingenuity of the human brain.

I have before me the details of the methods used in 12 large ship-building plants. Each one is different, essentially so, and the pre-eminence of each over its rivals is more or less complacently taken for granted by the firms concerned. There is something not unnatural—indeed, there is something worthy of respect—in this view. Each system is as much a part of the particular firm as is its output, having been developed by the members of the firm to suit its own peculiar needs, and to question the means employed in so elemental a thing as "checking-in" is to cast a reflection on the management.

The fact remains that each of the systems is different, and it is only human to ask for a reason. The plants are alike. The trades employed are the same. The number of men does not differ greatly. The nature, volume and general lay-out of the work done in each plant are not unlike. The systems of checking men in to work are different. Why?

Are there not certain principles upon which all systems of checking-in must be based; certain primary requirements that all must meet, and, going still further, is there not some one "best system" for such a set of similar plants?

NECESSITY FOR A CHECKING-IN SYSTEM.

PURPOSE OR OBJECT ATTAINED.

A. It is of manifest advantage to determine at the outset why we want a checking-in system at all, and what purpose we wish to attain. Before seeking a tool to accomplish a piece of work, one should first know exactly what work he wishes to accomplish. Unless this is done confusion is likely to result from our taking into consideration some apparently sparkling system that captivates the fancy by promising to accomplish some useful but foreign and unexpected result, while the primary and more important necessity is but indifferently cared for.

Aa. The primary purpose of any checking-in system is to furnish certain specific information; namely, information that certain employes have reported for work at or before a definite time.

The necessity for such a system is threefold: (1) Furnishes early information to the supervisory force as to what employes have reported for work and on time; (2) furnishes early information to the accounting department which will expedite the clerical work of cost keeping and making up pay rolls; (3) forges one single but valuable link in a more or less complete chain of evidence which is accepted as proof of an employe's presence at work and used as a basis for signing the pay roll. It may be noted that any system fulfilling (1) may be expected to fulfill (2) and (3). (As to records of exact time, see "time clocks," later.)

Ab. While there may be no question as to the threefold necessity above outlined being the primary object to be attained, the query will naturally be put, "Have we exhausted all the possibilities of a checking system?" By no means. We can demand of our system that it serve other purposes more or less valuable; in fact, there is no limit to the almost infinite number of requirements with which we may burden our poor system, but such additional purposes can hardly be considered of primary necessity nor a logical requirement of a checking-in system.

Ac. For instance, a time clock located on the job may be made to serve the additional useful but foreign purpose of recording the exact time devoted to that particular job. The additional information thus gained is: (1) Exact cost of job (sometimes). (2) Detect loafing of workmen (perhaps). This information would be extremely useful, but it is not fair to require the checkboard to furnish it. We want a check system to accomplish a certain

distinct purpose, and it is for the perfect performance of that purpose that we must judge our system, and not be biased because it can perform some other unexpected piece of work, no matter how useful.

If we hire a first-class ship-fitter, we would hardly be satisfied to find the man a first-class boiler maker but an indifferent ship-fitter. Manufacturers and inventors are constantly placing on the market combination tools and machines—a dozen tools in one or a machine that will do the work of twenty. These are seldom used by any but unskilled amateurs or those turning out a small volume of work. Where special work is constantly performed, special tools, special machines and special men are necessary.

So with a checking system. A plant as large as any of the larger government navy yards, or any of the prominent private yards, checking-in several thousand men daily, requires not a general all-around combination system, which will accomplish a variety of useful things, but a special system which will accomplish in the most perfect manner possible a specific result.

INFALLIBLE SYSTEM IMPOSSIBLE.

B. It is valuable to determine in the beginning just how perfect a system we can hope for, and thus save ourselves from seeking what might prove to be impossible.

Any system of checking must depend upon one or more of the human senses, as well as upon human intelligence.

Human senses and human intelligence are neither uniform nor standard, but vary greatly in quality. A few men are almost (but never quite) infallible; others again can never be depended upon. Often, indeed, the fallibility of the same man will vary daily, like a barometer, and all managers in charge of large offices know that 80 per cent of the clerical errors are made between 11.30 and 12 a. m. and 4.30 and 5.00 p. m.

A chain can be no stronger than its weakest link, nor a house more stable than its foundation; neither can a checking-in system be any more infallible than the imperfect human brain, eyes and hands on which it must depend.

The necessary time clerks employed to operate any checking system, being human, are no more infallible than others, and therefore contribute their full share to error.

It is self-evident that if reliance is to be placed upon the work

of a time clerk he should be a man selected for accuracy, and this quality in him tested rigorously and proved. *The ordinary employe is hired not because he can check-in without error, but because he can do some other work well,* while a time clerk is employed solely for the purpose of securing accurate time.

SYSTEM WHICH CANNOT BE BEAT.

Ba. Since it is impossible to devise an infallible system it is equally impossible to devise a system which cannot be "beat." Human ingenuity can never invent any system that human brains cannot find a method of outwitting. Not long ago vault builders thought they could build an impregnable vault. Almost immediately the oxy-acetylene flame exploded this idea.

Bb. Thus while it is impossible to devise a bank vault that cannot be broken, a coin that cannot be counterfeited, a checking-in system that cannot be "faked," we can at least hope for this: *To make "faking" so difficult that, although not impossible, it will not be practical.* (See Dd and De.)

DIFFICULTY IN SELECTING THE MOST PERFECT SYSTEM.

C. It is impossible to know for a verity that you have the most perfect system obtainable. This is entirely a matter of comparative judgment, time and place. We must be satisfied with something better than anything ever invented in the past. To invent a checking system for all conditions of time and place is not possible.

GENERAL REQUIREMENTS.

D. There must be some general requirements or rules applicable to all systems, and if these can be determined upon and clearly stated, they will serve as a valuable criterion by which to test any proposed system. The following is a statement of the most important of these requirements:

Da. *Eliminate Error.*—The system should be such as to eliminate error as much as possible, and to make accurate work easy.

Dc. *Easy to Discover and Trace Error.*—It should be an easy matter to discover error early and to trace it rapidly and inexpensively and rectify same.

Dd. *Simplicity.*—The operation of checking-in must be simple and yet not so much so as to be altogether mechanical. No single

system, however complicated, can be solely relied on, and absolute accuracy can only be obtained by multiplying the means of determining an employe's presence at work, and in the case of conflicting testimony accept the preponderance of evidence as conclusive.

De. *Multiply the Number of Men Responsible for Accurate Checking.*—By multiplying the number of time clerks, attendants, leading men, etc., within the limits of economy, errors are more readily eliminated and a more positive check secured on accuracy.

Df. *Durability.*—A delicate or complicated mechanism is not desirable. (See "time clocks," later.)

Dg. *Economy.*—From the point of view of economy any system must be considered in three lights, (1) initial cost, which includes, of course, purchase price and installation, (2) operation, which includes the number of time clerks and attendants required, and (3) maintenance and repairs.

Dh. *Location. Central Station.*—There can be no question but that the best location of any checking system is as close as possible to the one general entrance to the plant, such as the checking station at the Mare Island Navy Yard. (See Fig. 2) Where the plant has more than one entrance, the number should be restricted to as few as possible, and checking-in done *at the entrances.* At times men are almost certain to forget to check-in, and this the central checking-in station corrects, with all the men dropping their checks and the board staring a man in the face as he enters the plant. Also in a large plant, where a large proportion of the work is *outside* the shops, a central checking-in station obviates the loss of time of a man going to his shop at one end of the yard to check-in and returning to his job on a ship at the other end of the yard. After working at the Mare Island Navy Yard with the check boards in the shop and later with the central checking-in station, the writer estimates the saving due to this system per man for an outside force of some 800 men at not less than four minutes per day—truly a considerable item.

Di. *Ground Space.*—Economy would select the system demanding a minimum of ground space, but efficiency requires a certain liberality in this respect.

Dj. *Light.*—Since any checking system must depend upon the sense of sight, it is evident that such a system should be well lighted, and not hidden in some obscure or dark corner.

Dk. *Sight.*—Since any checking system must depend on vision, it is evident that whatever apparatus, checks or figures are used should be constructed so as to be easily distinguished. Size, shape, color and general arrangement should be such as to assist clear vision. For instance, if a large board is used, holding 500 checks, it could be so striped or checkered with several catchy colors as to greatly assist the eye in rapidly locating a desired position. It is not believed advisable to vary the shape of the checks, as this will render it too difficult to take a muster of the board.

Dl. *Time of Checking.*—It is desirable to have the checking operation performed early in the work day, preferably on entering the plant (see Dh) and a few minutes before starting work (see Aa).

Dm. *Recording Exact Minute of Checking not Necessary.*—Time clocks are not a necessity at a central checking station, certainly not at a navy yard. Such a clock will record the exact minute an employe enters the plant. This is unnecessary and useless information. It is desired to know that an employe has reported within the limits of the plant *before* a certain time. Whether he reports at 7.55 or 7 o'clock is not material. Clocks are useful where an employe is permitted to go to work as soon as he reports, or to remain at work as long as he likes, but their chief use is in the shop, and not infrequently the *repair* shop at that.

A good pair of scales to record each employe's exact weight as he entered the central checking-in station every morning and left each night would be quite as useful as a time clock—perhaps more so. If a man quit work each night weighing two or three pounds less than when he reported for work, it might be assumed that he lost weight due to working hard. Again, if a man showed a steady gain in flesh after several months in a navy yard, his case might bear looking into. It could be so arranged that the weight could be automatically printed on individual time cards, and men increasing in weight would have this printed in scarlet. Red would mean "Danger; investigate your man!"

Dn. *Speed of Checking-in.*—Economy of time would demand a system requiring a minimum of time for the operation proper. On the other hand, efficiency (or accuracy) sets a limit on this time. A checking system depends upon the human intellect and senses. As all these functions require time for their performance, it is evident that there is a minimum time beyond which we can-

not go without a sacrifice of accuracy to speed. The former is *essential.*

Do. *Speed and Ease of Muster.*—The type of board and check must be such as to facilitate a speedy muster being taken immediately after the board is closed (see Aa) and if possible by one man.

Dp. *Loose Checks.*—Whatever is loose will be lost. A system involving loose or removable checks is not as desirable as one in which all parts are permanently secured to the board.

Dq. *Check should be out of Reach when Once Turned.*—Once a man has turned a check it should not be possible to again tamper with it at that muster.

The photograph (Fig. 1) shows a system in which a man can turn his check on entering the plant, and another man, either through carelessness or intent, can turn the check back. Thus it is possible for both men to believe themselves checked in, and to be actually at work, although the board shows them both *out.* Again, when a man's check is found unturned he can state that he turned his check, but another man turned it back, and this lack of conclusiveness of the fact renders the muster of doubtful value, and prevents the management, in all fairness to the men, from enforcing strict rules.

Dr. *Number of Musters. Necessity for Checking-Out at Night.*—Checking-in in the morning merely indicates that an employe has reported for work. Checking-out on leaving the plant is another link in the chain of evidence, and is proof (partial, not conclusive) that the employe has spent the day at the works. A man might go home an hour early—the check at night shows this.

Ds. *Necessity for Checking-out at Noon.*—For the same reason that a man checks-out at night, a careful management would require him to check-out at noon, provided he was *not* to return again in the afternoon. For the other men who *do* intend to return, this checking out at first appears unnecessary, but if the rule is not made general the man who is *not* to return would invariably forget to check-out. At plants using individual time cards, employes leaving at noon rarely remember to leave a time card for the morning's work. Suppose he goes home at noon, intending to return at one o'clock. He meets a circus parade and changes his mind. It is hardly likely that he will return and check-out. When it is customary to check out at noon

every man gets the habit, and the man going home at noon checks out with the others. For those who return, neither advantage nor harm is done, while for those who do not, their check indicates that fact.

"After careful comparison of the merits of the various systems shown and others that have been investigated, it is believed that a combination of the central checking-in station idea and a system similar to that adopted by the Washington Navy Yard, presents, by far, the most satisfactory solution of this difficult and complicated problem, for ship yard purposes where a large proportion of the force is working outside the shops."

THE CHECKING-IN DEVICE AS USED AT THE WASHINGTON NAVY YARD.

This register is so simple as to hardly need any explanation. A child can operate it. It is exceptionally durable. Nothing to wear out or get out of order. Its serviceability therefore is almost limitless.

The construction involves a backing of sheet brass installed in a hardwood case. The sheet brass backing has rows of inverted V-shaped slots cut therein, in which the checks slide by means of a specially formed rivet.

One half of each slot (the inverted V) is exposed, the other half is hidden by a frame of metallic slats, so arranged that it can be slid from one side to the other, exposing always one-half of each slot.

The riveted checks ride freely in the slots but cannot be taken from the board by anyone without authority. There is provided a place in one of the lower corners of each slot, with a spring attachment for removing or replacing the checks; the spring has to be pushed back by a pointed instrument to release the rivet, after which the check can be removed or replaced.

A glass paneled sliding door is provided which completely covers the register and prevents tampering with it when not in use. The right hand side of the cabinet is used as a bulletin board for posting orders or notices to employes.

The cost of maintenance is almost nothing, and the prices of the registers are within the reach of any institution, business, factory, schools, or others, so there cannot be anything prohibitive in their use. There are no clock works or mechanical con-

trivances to get out of order or create embarrassment. It is absolutely positive in its action and results.

FIG. 1.

The Washington, D. C. Navy Yard, U. S. Naval Torpedo Station, Newport, R. I., Charleston, S. C. Navy Yard, Union Twist Drill Co., Athol, Mass., Boesch-Lomb Optical Co., Rochester, N. Y., and other places have been using these registers for

some time and all reports thus far received have been extremely favorable.

Fig. 1 shows details of check board used at Central Checking-in Station, Mare Island Navy Yard. The tin tags covering the numbers and the pieces of tape on the staples are used to show "dead" or unused checks. See Dq. The operation of checking in or out is performed by turning the check face outward over on the other half of the staples.

FIG. 2.

Fig. 2 shows the Central Checking-in Station, Mare Island Navy Yard. Fails to meet requirements Da, Dg, Dh, Do, Dq.

Fig. 3 shows a line of workmen at Cramp's Ship Yard about to check-in. This is done here at several entrances by the men calling their check numbers out as they pass through the check house. The number is written down by a clerk in the time-keeping department. Two musters a day.

Fig. 4 shows check house of outside machinists at Newport News Shipbuilding and Engine Co. Outside machinists and shop machinists are handled as separate departments. Shop machin-

FIG. 3.

FIG. 4.

ists have a check box located within the shop. Outside machinists known as steam engineers have a small check house located in yard central to the ships; and all men employed in the steam engineer's department pass through check house before starting work a. m. and p. m. Each man as he passes through this house takes from hook a brass check bearing number which has been previously assigned him at the time of his employment and de-

FIG. 5.

posits this check in a box at the exit end of the check house as he passes out.

Fig. 5 shows the Common Sense Register as adopted by the Washington Navy Yard and represents an employe in the act of registering, simply using his finger to push upward the numbered check to the apex of the inverted V-slot, when it passes over the apex and drops down in the other side of the groove or slot behind the metal slat.

Fig. 6 represents the register after the employes have registered, the checks which remain visible showing the absentees.

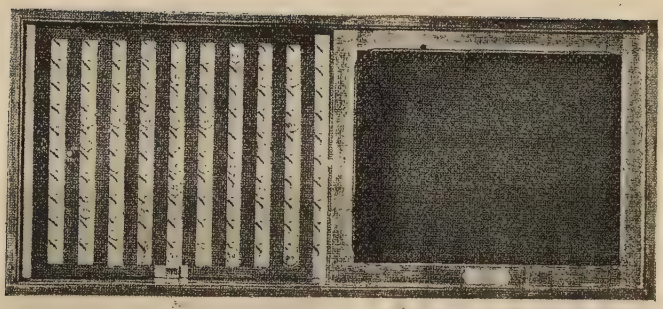


FIG. 6.

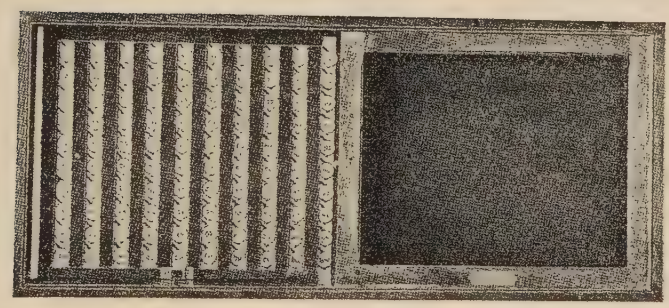


FIG. 7.

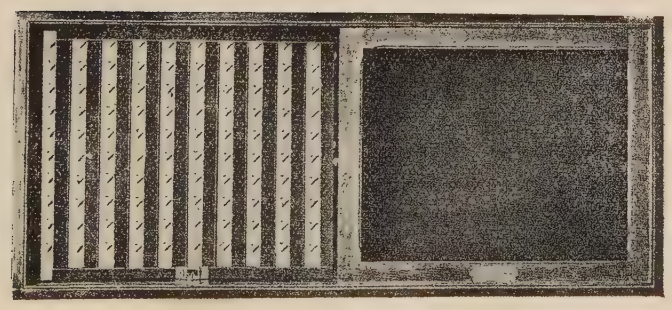


FIG. 8.

Fig. 7 represents the register before registering commences, with all the checks exposed. All that was necessary to be done since registering, was to push over absentees' checks, after making a note of them and slide the frame of slats to the opposite side. No assorting of checks necessary. They are all in place ready for

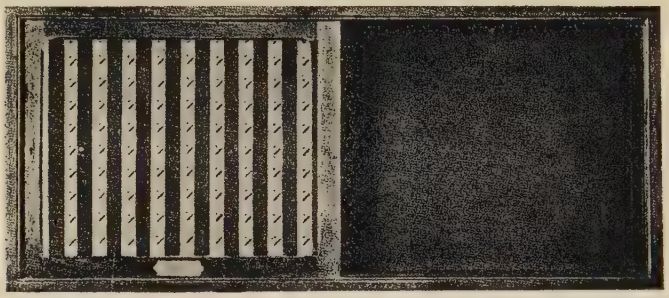


FIG. 9.

the next turn to register, and occupying the same relative positions.

Fig. 8 shows the register with all the checks behind the metallic slats, none being visible. This prevents the register being tampered with.

Fig. 9 shows the register closed; all checks are hidden by the metallic slats, and glass door locked to prevent tampering.

DISCUSSION.

The U. S. Naval Academy Training.

(See No. 138.)

Lieut.-Commander W. T. Cluverius, U. S. N.—I must take exception to the form of question epitomized in this paper: "Is the present system at the Naval Academy the best one for achieving the purpose for which the government maintains it?"

I fail to find any discussion which establishes the necessity of an inquiry as to the success or failure of the *system* rather, it appears, this paper deals with the *operation* of the system chiefly in regard to the proportion of theory and practice obtaining and is an investigation into the curriculum and not the method of instruction. This latter has itself been under fire from time to time and has in its essential characteristics withstood the attacks.

A system in which the student is called upon daily and in which frequent examination—the accepted criterion—is a part is certainly more adapted to the enforced acquirement of the technical foundation of the naval profession than is a system, for instance, made up of lectures or similar means of imparting the knowledge of which the degree of absorption is voluntary.

For the efficient operation of the existing system the proper instructor is fully as necessary as in the other and in order that examinations be the standard of reference, they must be real indices of the work of the period embraced.

I refer, then, to the system as maintained at its highest state of development and with it in this condition it is believed that the paper considered does not take issue.

The chief criticism seems to be that the theoretical principles of the subjects taught are too little dwelt upon. It is granted that the course "gives the graduate a thorough practical foundation upon which to begin his career." I submit that this result alone is much to be desired.

In the naval profession, with its varied and special demands of a practical nature and wherein personal initiative is so distinctly a factor, the successful officer is the practical man.

The writer suggests that additional theoretical subjects be incorporated and that those now included, be taught more *in extenso* reducing if necessary the amount of practical instruction. He would thus balance the course.

Indisputably, theory is the basis of all knowledge and in the mastery of any profession, all endeavor must be founded upon it. The requirements of naval education embrace diverse technical studies deeply and differently rooted in the theory underlying many sciences. It is a problem

just how far to go into these theories to insure the amount necessary for their sound practical application.

I cannot agree with the writer that more theory is needed.

I believe, instead, that the inclusion of the maximum of theory consistent with the attainment of a thorough working knowledge of the various branches of naval science should be the standard sought in the operation of the Annapolis system.

It is my opinion that the midshipman does not properly digest the theory which now goes to make up his daily mental diet. If this is the case, then is the practice correspondingly affected.

The writer of the paper is satisfied with the practice acquired and desires more theory. I believe that even a greater amount of practical instruction should obtain and the amount of theory now included should be placed more securely in the midshipman's grasp.

In both considerations the time allowance imposes limitations.

There is, today, making its appearance, a national tendency to slow down a bit in covering the field of instruction. Our educational systems are comprehending depth of investigation rather than its superficial area. I mean that the governing consideration is becoming thoroughness rather than extent. This does not necessarily imply more theory but it does imply increased opportunity of assimilation of both theory and practice alike. There now exists in so many cases a smattering of both—a surface application, as it were.

This tendency must extend to the Naval Academy upon which institution the demands of the service are more insistent than ever before. To keep the pace of present naval activity, the step must needs be lengthened but it must also be sure.

The time limit must be changed.

It has been previously recommended and is again strongly urged that much can be accomplished in the indicated direction if the course at Annapolis be increased from four to five years maintaining the same curriculum adjusted to meet the changed conditions.

No compromise between theory and practice would be needed as more time becomes available for both with the proportion remaining as at present. There could be included in the course two practice cruises of five months uninterrupted duration, for instance, which would furnish an excellent equipment of practical ordnance, navigation and engineering of all kinds. If this, or a similar adjustment, would render the conditions for the student normal, then would mental digestion be restored and assimilation assured to so successful a degree that the midshipman commissioned at the end of the course would present an affirmative answer to the question as to whether or not Annapolis was accomplishing the object for which created.

PROFESSOR S. J. BROWN, U. S. N.—The article of Lieut. Logan Cresap, on the course of instruction at the Naval Academy, recognizes the problem which is today common to all technical schools and colleges—the proper balance of theory and practice in engineering courses of study. The

number and diversity of new mechanism rapidly introduced in all branches of engineering has caused a tendency everywhere to throw the technical course of study strongly in the direction of details of construction and management rather than thorough study of the theory of such novelties. In the 5 years since the graduation of Lieut. Cresap, the Naval Academy course has hardened in the direction which his article criticises:—the practical course in electrical engineering, wireless telegraphy, has been added to the long established course in physics; ordnance has taken up the study of spotting and gun pointing, as an important part of the ordnance course; steam engineering has taken up explosive engines and turbines as an essential part of its course, until the course of instruction of the midshipmen at the Naval Academy has become too much congested for the best results. The cause of this has been that the shortage of officers has required the graduate to be prepared immediately on graduation for responsibilities beyond the training and experience usually derived from the four years of college life.

Now that the deficiency has been supplied, although the material is not yet all available as commissioned officers, it makes a convenient opportunity for taking up the question of theory versus practice in the Naval Academy course. It may be of benefit to consider the results of this demand for technical training upon the courses of study in technical schools and engineering courses in college. The student in these schools, having chosen his profession from natural ability or inclination, approaches the course of study with a recognition of its difficulties, and the necessity of a mastery of both theory and practice, if he is to succeed in the competition of life; on the part of the technical school is a recognition at the start of the necessity of thorough preparation and sufficient maturity to get the greatest advantage from the prescribed course of study, and that the graduate would have to serve a severe apprenticeship before gaining the degree which finally completes his professional course of theory and practice.

The lower limit of age of admission into technical schools is somewhat higher (17 years), than at the Naval Academy, and the mental examination covers a wider field; algebra (through quadratics), plane and solid geometry, elementary plane trigonometry, and elementary physics—an addition to the requirements for entering the Naval Academy, of solid geometry, plane trigonometry, and elementary physics. The candidate for engineering courses is further required to make 70 per cent in his examination in mathematics. The above qualifications are for the Massachusetts Institute of Technology, which fairly represents the requirements of the best technical schools, while for purely engineering courses in other colleges (Columbia, for instance), the minimum age of admission is 18 years. This usage of technical schools and colleges, in respect to age of admission and mental requirements, represents the experience of many years, and the conclusion in these respects ought to be of value to our Academy which is strictly a technical school—that maturity of judgment, and character and efficient preparation are necessary for the accomplishment of such a course of study.

Before the introduction of steam into the Navy, there was much reason for the early age of admission then in vogue, 12 to 14 years, as the education of the line officer began with the acquisition of the sea-going habit—getting a good pair of sea legs. But with time the constant increase in the mechanism of war, powerful, yet delicate and of wonderful precision, has entirely changed in this respect the requirments of age and mental preparation. Unless the course at the Naval Academy is made largely a theoretical one, and postgraduate study be made for acquiring knowledge of widely diversified branches of engineering, we shall have to increase the mental requirements for admission and with it a slight increase in the average age of admission, 18½ years. If the present age is retained (or changed 17 to 19), the requirements should be more nearly those of other technical schools. So far as the preparation for the mental test is concerned, the amount of time now devoted to constant repetition of the very elementary subjects of plane geometry and algebra (through quadratics), would be much more advantageously employed in the application of these subjects to solid geometry and plane trigonometry, as it would vitalize those otherwise dry subjects by showing their simple extension into practical use. In such a case, the written test in these subjects, the examination covering the same length of time, would be better tests and easier for those having a real understanding of the subject, than the present more difficult examination in the narrow field. With these subjects out of the way, and the maturity of judgment which their accomplishment would represent, there would be found time for more thorough theory.

Whether or not the best naval officer will be the result of this intensely practical course or of a course where the required readiness is sought rather by a thorough foundation in theory, leaving the practical side of the profession to be acquired after graduation, is a question which can never be perfectly answered. If the naval officer of the future is to be ready at any time to perform the expert duties in steam engineering, electrical engineering, problems of engineering in ordnance, naval construction, or any one of the many lines which are becoming differentiated in the naval profession, it is manifest that the special knowledge required for these duties must be acquired after graduation, and must be left largely to the efforts of the individual. No four years' course of study with young men beginning between the ages of 16 and 20 could prepare any one, even in the theoretical requirements, for such a diversified calling, and the present course at the Naval Academy, with some modification, will give as a good foundation for that subsequent preparation as any other.

LIEUT.-COMMANDER W. B. WELLS, U. S. N.—The subject of this article is a very broad one, and the question, "Is the present system at the academy the best one for achieving the purpose for which the government maintains it," is only discussed from one point of view, viz., too little theory and too much practical in the class room. It goes without saying that we want practical men for naval officers. Admiral Melville's defini-

tion of a practical man seems a good one. "The real practical man is the one who has so trained himself, both in theory and in practice, that he is ready to solve the problems which come before him in his daily work." To answer the author's question it will be necessary to analyze the course given.

It will be remembered that the Naval Academy is expected to take a boy just passed sixteen (minimum age of admission), and give him: 1. A general education. 2. A professional education. And the profession is a very broad one.

To arrange a course to fulfill this condition is, to say the least, difficult. Granted that more theory should be taught. What should be omitted? Take the course in the department of marine engineering and naval construction with which I am particularly familiar and which is as follows:

ARRANGEMENT OF CLASSES BY TERMS, 1911-1912.

		1st Term.	2d Term.
1st Year.....	4th Class	.....	4 pers. Drawing.
2d Year	3d Class	4 pers. Drawing	3 pers. Mech. Pro.
3d Year	2d Class	3 pers. Prin. Mech..	5 pers. Mar. Engines and Boilers.
4th Year	1st Class	5 pers. Naval Con. Eng. Mechanics.	4 pers. Exp. Eng., Gas Engines and Turbines.

The time allotted to this department is probably a fair share considering what it is expected to cover.

In mechanical drawing, 8 term-periods* are not too many when it is expected to teach a young man to look at a complicated drawing and have a picture in his mind of the machine, or that he can take a draftsman's drawing and tell wherein it does not represent the apparatus intended.

In mechanical processes, three term-periods are given in which he is taught how materials from their natural state are made into useful parts or apparatus used in the navy.

Principles of mechanism is given three term-periods. The name of this subject will indicate its importance.

Marine engines and boilers are given five term-periods. Under this heading a little theory of the action of steam is taught but it is mostly descriptions of apparatus used. After he finishes this subject he can read a description and with the assistance of drawings readily understand any mechanism or apparatus that is new to him.

Of secondary value is the fact that while he is learning this "language of the material" as it might be called, he is learning the details of the machinery now used in the service.

* A term-period meaning a two-hour period per week for one term.

Five term-periods about half of which is devoted to naval construction and half to engineering mechanics or designing.

Four term-periods are given for experimental engineering, gas engines and turbines, about half the time being spent on experimental engineering.

During the last two years of the course I should say about half the work is descriptive of apparatus or parts of machinery.

What part of this course should be omitted to take up thermodynamics, machine design, precision of measurements or any, more theoretical subject?

Some of the sketches and descriptions might be omitted from marine engines and boilers and more principles might be taught. That is the tendency in this branch now.

If the work done by all other departments should be analyzed carefully, there would come up the same question, what can be omitted?

The range of age limits at entrance is, in the opinion of a large number of officers, too great. Many want to make the entrance age from 16 to 17 inclusive. Why not make it 18 to 19 inclusive and require the education for entrance such as might be expected in a young man of that age, and is required in all colleges for their technical courses?

Require them to be high school graduates or to have pursued an equivalent course and in addition, give them a suitable entrance examination.

By this method a year's work, more or less, in the course as it now is might be omitted and its place could be taken by some of the subjects suggested by the author.

The question brought up, that in this democratic institution, if the entrance requirements are raised, it would not give the boy in certain outlying districts and from country places an equal show with the boy who has had greater advantages.

With the school system so excellently developed in all parts of the country a high school education should be within reach of nearly all who have the energy to go after it. And a larger number of the suitable young men of the country of the ages 18 to 19 inclusive can pass, without previous preparations, the examinations in the more advanced work, than could pass the entrance examinations as they now are.

PROFESSIONAL NOTES.

Prepared by Lieut.-Commander W. B. Wells, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Rivadavia	28,000	Fore River Shipbl'dg Co.	Building.
Moreno	28,000	New York "	"

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Radetsky	14,500	Trieste.	Under trial.
Zrinyi	14,500	"	Launched April 12, 1910.
Erzherzog Franz Ferdinand.	14,500	"	Under trial.
Viribus Unitis	20,000	"	Launched June 24, 1911.
V	20,000	"	"
VI	20,000	"	Authorized.
VII	20,000	Fiume.	"

The Austrian battleship *Viribus Unitis* was launched at Trieste on June 24. The vessel is 493 feet long and 91 feet beam, with a draft of 27 feet, the completed displacement being in the neighborhood of 20,000 tons. Three sets of turbines, aggregating 26,000 horse-power, are designed to give a speed of 21 knots. The armament consists of twelve 12-inch guns in four center-line turrets, two being superposed, so that six guns bear ahead and astern; twelve 6-inch and eighteen 3.4-inch, five 18-inch torpedo-tubes, are also to be mounted. The maximum thickness of the belt is 12 inches, and the total weight of the armor carried is said to be 6000 tons.—*United Service.*

CHINA.

A Cruiser for the Training of Chinese Officers.—Messrs. Vickers, Limited, launch to-day (Friday) from their Naval Construction Works, Barrow-in-Furness, a cruiser named *Ying-Swei,* for the Chinese Navy, for the training of officers and men in connection with modern munitions of naval warfare, and therefore a forerunner of that new navy which will be built within the next few years for China.

While having all the fighting capacity possible in a ship of the draft (13 feet) and of the limited displacement (2400 tons) prescribed by the Chinese authorities to meet certain harbor conditions, she excels in the comprehensive character of the provisions introduced for training purposes. Messrs. Vickers, Limited, are responsible for the design, which,

like the plans for many of the later warships built by the company, have been prepared by Mr. T. G. Owens, the naval constructor and a director of the company. The special features of the design are: (1) The great variety in the size of the guns fitted—6-inch, 4-inch, 14-pounders, 3-pounders, and 1¼-pounders—all introduced primarily for instructional purposes; but incidentally making the cruiser a formidable fighting ship. (2) The different types of boilers on board—cylindrical and water-tube—so that the Chinese stokers may acquire experience. (3) The adoption of alternative systems of auxiliary machinery as far as is consistent with efficiency, for the education of Chinese officers and crew. (4) The unusually large quantity of ammunition carried; 160 rounds for each of the two 6-inch guns, 200 rounds for each of the four 4-inch guns, and 1000 rounds for each of the smaller guns, which permits of extensive battle practice, and confers the advantage of the maintenance of a long engagement in war. (5) The embodying of an unusually thick protective deck—1½ inch—in such a light cruiser. (6) The ensurance of a speed of 20 knots under easy steaming conditions and without exacting that care and organization in the stokehold which come only with prolonged experience. The principal dimensions of the ship are as follows:

Length between perpendiculars	330 feet.
Breadth, moulded	39 feet 6 inches.
Depth, moulded	23 feet 9 inches.
Mean draft	13 feet.
Displacement (about)	2500 tons.
Speed (about)	20 knots.

The armament consists of two 6-inch quick-firing guns, one carried on the forecastle deck, and the other on the poop deck; four 4-inch quick-firing guns, placed on the upper deck—two at the aft end of the forecastle, and two at the fore end of the poop, at the sides of the ship; two 14-pounder quick-firing guns—one on each end of the upper deck amidships; six 3-pounder quick-firing guns—three carried on each side of the upper deck in the waist, and two 1¼-pounder quick-firing guns placed on the bridge. Two 18-inch revolving deck torpedo-tubes are carried, one on each side of the upper deck aft. The guns and torpedo-tubes are controlled in accordance with the latest practice. Accomodation is provided for 230 officers and men and 40 cadets.

The propelling machinery is of the Parsons turbine type, with three lines of shafting, and one propeller on each shaft. The turbines are arranged in one engine room. The high-pressure ahead turbine is on the center shaft, and a low-pressure ahead on each wing shaft. The wing shafts are arranged for working astern, a reversing turbine being incorporated in each of the two low-pressure turbine casings.—*Engineer.*

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleship.			
Danton	18,350	Brest.	Under trial.
Mirabeau	18,350	Lorient.	" "
Voltaire	18,350	Bordeaux.	" "
Diderot	18,350	St. Nazaire.	" "
Condorcet	18,350	"	" "
Vergniaud	18,350	La Seyne.	" "
Courbet	23,500	Lorient.	Building.
Jean Bart	23,500	Brest	"
France	23,500	St. Nazaire.	Authorized.
Paris	23,500	La Seyne.	"

TRIALS OF THE FRENCH BATTLESHIP "MIRABEAU."—The French battleship *Mirabeau* has recently completed her official trials, and we give below a summary of the speeds achieved and of the consumption of coal under various conditions. The vessel is fitted with Delaunay-Belleville water-tube boilers, twenty-six in number, having a combined grate area of 145 square meters, and a heating surface of 4787 square meters. Her safety valves are set to blow 18 kilos. per square centimeter, say 256 pounds per square inch. The engines consist of two sets of Parsons type turbines working on four shafts.

Ten Hours Full Speed Trial.

Date	20th June
Number of boilers at work	26
Consumption of coal per mile, contract	967 kilos. = 2131 lb.
" " " actual	939 kilos. = 2069 lb.
" " " sq. m. of grate per hour	128 kilos. = 282.1 lb.
" " " sq. ft. " "	26.2 lb.
Number of revolutions	321
Mean speed (contract 19.25 knots)	19.73 knots

Six Hours Trial with only Thirteen Boilers at Work

Date	23d June
Consumption of coal per mile, contract	410 kilos. = 904 lb.
" " " actual	400 kilos. = 882 lb.
" " " sq. m. of grate per hour	40 kilos. = 88.2 lb.
" " " sq. ft. " "	8.2 lb.
Number of revolutions	221
Mean speed	14.53 knots

Twenty-four Hours Trial with all Boiler at Work.

Date	27th and 28th June
Consumption of coal per mile, contract	685 kilos. = 1510 lb.
" " " actual	667 kilos. = 1470 lb.
" " " sq. m. of grate per hour	84 kilos. = 185 lb.
" " " sq. ft. " "	17.2 lb
Main speed	18.28 knots

Six Hours Consumption Trial with Nine Boilers at Work.

Date	6th July
Consumption of coal per mile, contract	289 kilos. = 617 lb.
" " " actual	268 kilos. = 569 lb.
" " " sq. m. of grate per hour	19 kilos. = 41.9 lb.
" " " sq. ft. " "	3.89 lb.
Number of revolutions	163
Main speed	10.74 knots

These results were arrived at in spite of the fact that one of the propellers had one of its blades damaged.

THE FRENCH SHIPBUILDING PROGRAM.—The shipbuilding program, proposing the construction of 16 battleships, prepared by Admiral Boué de Lapeyrère, lately French Minister of Marine, has not yet received the effect of law, though, in the first two years, 1910 and 1911, its provisions have been observed by the laying down of the *Jean Bart* and *Courbet* (one of them additional to establishment and the other replacing the *Brennus*), and the *France* and *Paris*, which are to be begun this year, both of them additional. M. Delcassé, the new Minister, intends in the autumn to embody the remainder of the program in a bill to be presented to the Chamber. Admiral de Lapeyrère proposed that the last ship of the series should be laid down in 1919, but this arrangement was much criticised, though it was ruled by financial considerations, and M. Delcassé's object is to anticipate that event by two years, which will make it necessary to lay down four ships instead of two in 1915. The following is the new scheme, showing the ships to be replaced, as intended by Admiral de Lapeyrère: 1912, two ships (*Carnot* and *Charles Martel*); 1913, two ships (one additional, one replacing *Jauréguiberry*); 1914, two ships (*Bouvet* and *Masséna*); 1915, four ships (two additional, two replacing *Charlemagne* and *St. Louis*); 1916, none; 1917, two ships (one additional and one to replace *Gaulois*). The age limit is to be 25

years for ships begun before 1906, and 20 years for later ships. It is intended to construct dry docks at Lorient and Sidi Abdallah, Tunis.—*The Engineer.*

SITUATION OF THE FRENCH DOCKYARDS.—The increasing expenditure on the navy, and the demands for other services, combined with the fact that M. Delcassé regards the program as a minimum, cause the situation of the dockyards to be questioned with great anxiety. It is recognized to be an absurdity to maintain five home dockyards and port establishments, all organized on the same system and with identical organization, while only two of them are in full activity, and various departments at the others, as the French say, *tournent à vide.* Brest is intended to be fully equipped; the two docks will be completed, the entrance to the Penfeld, where the dockyard is, will be widened, and new buildings will be erected at Lanninon, between the Penfeld and Porzic. Toulon will also be maintained in full activity, and there is great reluctance to touch Cherbourg, though M. Chautemps, who has reported on the estimates to the Senate, would suppress everything there that was not concerned with the flotillas. He would do away with the naval prefectures at Lorient and Rochefort. The importance of the former is considerable, as is shown by the intention to construct new docks there, but Rochefort has lost its value, and has been maintained merely out of consideration for local feeling and interests. It is highly probable that progressive reductions will be introduced there, and that in the end the place will be maintained, with reduced staff, as a secondary arsenal.—*The Engineer.*

FRENCH NATIONAL DEFENCE.—The discussions which have arisen out of the reorganization of the French high command have caused attention to be concentrated on problems of national defence, and several writers have been pointing out the want of co-ordination between the Departments of War and Marine. The staff of each has a small section concerned with the relations with the other, but they are almost wholly occupied in administrative matters, and sometimes contentious affairs. General Langlois has therefore suggested that there should be a staff wholly occupied in the consideration of national defence from the point of view of both services. His idea is that this suggested staff should consist in equal numbers of military and naval officers selected for their fitness for such duties. He hopes that the result might be to establish a permanent link between two services, which have the same object, but which are usually too much engrossed in their own occupations to have time for other concerns. Moreover, there is a certain rivalry or jealousy between them, which is not for the public good. Evidently the professional section of the Superior Council of Defence has attained small results, and the general's plan meets with some measure of approval. So far, however, it has been the subject merely of general discussion, and no administrative change has been made. The new arrangements for the Defence Council seem meantime to be reducing the importance of its permanent section.—*Army and Navy Gazette.*

FOUR-GUN TURRETS.—The French, always daring and enterprising in their experiments, are about to go one better than all the rest of the world, and build battleships to carry four-gun turrets. The twin turret has been with us for nearly half a century, and the triple turret has also come to stay, after a long period of experiment and trial during the present century by our American cousins, and lately, also, by severel of the large Continental naval nations, such as Italy, Austria, Russia, and some of the South American Republics. But before Britain has a triple-turret battleship, it is now certain that France will possess a capital ship carrying four guns in a single gun-house. By this means it is intended to keep down the dimensions of the capital ships of the French

Navy, and, by placing the turrets on the center line, secure a concentration of broadside and end-on-fire, never before effected in ships of the tonnage that France will presently place on the stocks. But four-gun turrets have their disadvantages as well as their advantages, for by placing so many eggs in one basket, a large part of a ship's hitting power, amounting to something never less than one-third, may be withdrawn from the captain in the height of a closely contested engagement, by a simple, and not altogether uncommon, accident in the turret itself—such as a pipe, or wire, going wrong in the machinery for working the guns, or training the turret itself. There are so many things interdependent in the turret-working apparatus that, duplicated as it is, there are many chances of a temporary breakdown, and a temporary loss of one-third of the primary armament in the heat of an action would be a very serious matter. Still, four-gun turrets have advantages as well as disadvantages, and there is a lot to be said in their favor.—*United Service Gazette.*

Aviation experiments were made at Cherbourg recently with a view to testing the capacity of an aeroplane to discover a submarine. The trials were carried out with two torpedo-boats and two submarines on a day when there was only a slight breeze and a calm sea. In the first case the pilot Aubrun was told approximately where the two submarines lay, and he, keeping at a height of about 1000 feet to 1200 feet, found them both very easily about three miles out. The second test was more difficult, as no hint was given as to the locality of the submerged ship. Aubrun started from the Polygon and described circles after the fashion of a hawk, at about the same altitude as before, gradually bearing away to sea on the left. As the sun was low and the rays slanting across the water, it was not easy to see the sea bottom, but after a while Auburn noticed some flashing reflection from the periscope, and was then quickly able to discover the body of the submarine in water of about 20 feet depth. The result of the experiments is taken to prove that an aeroplane can discover a submarine from a height of over 3000 feet, whereas the periscope does not reflect the image of the aeroplane after more than half that height. At the same time, it will never be easy to find a submarine even by the most practiced pilot, for it is a mere speck in the vast volume of the sea.

These trials will be followed shortly by others, and it is already considered necessary that, for such scouting, a slow machine that flies about 45 miles an hour is better than the fast scout, which does best service generally when attached to a fleet. The way is open to a whole series of new maneuvers, whose program would comprise the search for submarines at different depths in calm and rough weather—the search for floating and fixed mines, combined action of aeroplanes, cruisers, and torpedo-boats, the torpedoing of submarines pointed out by aeroplanes, by torpedo-boats, and also by torpedoes launched from the aeroplane itself, etc. From the great activity in the French Army and Navy aeronautic departments it is evident that aeroplanes are intended, and expected, to play a formidable role in the next war, and the French mean to keep the lead they have established in this new branch of scientific warfare.—*United Service Gazette.*

The naval forces of France have been reorganized. Instead of there being equal fleets in the Mediterranean and in the Channel, the whole of the active forces will be grouped in the Mediterranean, while in the northern waters there will be only a reserve fleet. In ordering this redistribution, M. Delcassé, the Minister of Marine, has reverted to the scheme which existed before Vice-Admiral Boué de Lapeyrère became Minister of Marine in 1909. The original plan of Mediterranean concentration had been introduced by M. Thomson in 1906, after consulta-

tion with the British Government. Vice-Admiral de Lapeyrère has been appointed commander-in-chief of the rearranged forces, and will have as his flagship the *Danton,* which came to Spithead for the Coronation Review. Five other ships of the same class will form the first battle squadron. They are 18,000-ton ships of an improved *Lord Nelson* type, armed with four 12-inch and twelve 9.4-inch guns, and driven by turbine engines. The second squadron will be commanded by Vice-Admiral Bellue. It will consist of the two ships of the *Patrie* and the four of the *Justice* class, the former having four 12-inch and eighteen 6.5-inch guns, and the latter four 12-inch and ten 7.6-inch. Each of these battle squadrons will have three armored cruisers and six destroyers attached, and there will also be a group of reserve ships for each, based upon Toulon and Brest respectively. The third squadron of six older battleships and three armored cruisers, manned in the reserve with nucleus crews, will also be based on Brest. Destroyer flotillas will be attached to each fleet.—*The Engineer.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Ost-Friesland	19,000	Wilhelmshaven.	Launched Sept. 30, 1909.
Thüringen	19,000	Bremen (Weser Yard).	Under trial.
Helgoland	19,000	Kiel (Howaldt).	Launched Sept. 26, 1909.
Oldenburg	19,000	Danzig (Schichau).	" June 30, 1910.
Kaiser	20,000	Kiel (Kaiserliche W.).	" Mar. 22, 1911.
Frederick the Great.	20,000	Hamburg (Vulkan).	" June 10, 1911.
Ersatz Hagen	20,000	Kiel (Howaldt).	Building.
" Aegir	20,000	Danzig (Schichau).	"
" Odin	21,000?	Germania Works.	"
" K. Friedrich Wilhelm			Authorized.
" Weissenburg			"
" S		Wilhelmshaven.	"
Armored Cruisers.			
Moltke	21,500?	Hamburg (Blohm and Voss).	Launched April 7, 1910.
Goeben	21,500?	"	" Mar. 30, 1911.
J	21,500?	"	Building.
K			Authorized.
Protected Cruisers.			
Breslau	4,500 ?	Stettin (Vulkan).	Launched May 16, 1911.
Magdeburg	4,500 ?	Bremen (Weser).	" May 13, 1911.
Ersatz Cormoran	4,500 ?	Bremen (Weser).	Building.
" Condor	4,500 ?	Wilhelmshaven.	"
" Seeadler			Authorized.
" Geier			"

THE NEW GERMAN WARSHIPS.—The new issue of the German naval annual, *Nauticus,* gives additional particulars concerning the battleships of the 1898 program, the *Oldenburg* of the 1909 program, and the battle cruiser *Moltke.* In regard to the battleships, the facts support generally the statements already made. The armament is analogous in arrangement to that in the *Nassau,* there being twelve 12-inch guns in six double barbettes, and in addition fourteen 5.9-inch quick-firers, being two more than in the *Nassau,* and fourteen 3.4-inch. The dimensions of these ships are 546 feet 4 inches on the water line, with 93 feet 6 inches beam, 27 feet draft, and a displacement of 22,800 tons. With reciprocating engines of 28,000 horse-power, a speed of 20.5 knots is designed. Steam is produced

by 15 marine boilers, and while the normal coal supply will be 900 tons, the maximum will be 3000 tons. The particulars concerning the *Moltke* show that some statements made were incorrect. The length is 613 feet 3 inches, the beam 96 feet 9 inches, and the draft 27 feet, with a displacement of 23,000 tons. The armament consists of ten 11-inch guns in five double barbettes planned as in the *Von der Tann,* except that in the *Moltke* there are two barbettes abaft, of which the one nearest amidship will fire over the other. Thus the bow fire is from six of the big guns, and the stern fire from eight of them. The secondary armament consists of twelve 5.9-inch guns, and there are also twelve 3.4-inch. This ship has Parsons turbines of 50,000 horse-power, and the designed speed is 25.5 knots. The normal coal supply will be 1000 tons, and the total supply 3100 tons. The *Moltke* will have four torpedo-tubes, and the battleships six. The *Goeben,* of the 1909 program, will have the same general characteristics.

THE NEW GERMAN BATTLESHIPS.—It would appear from the comments of the German Press that the proposals of the German Navy League for setting a different interpretation upon the Navy Law are received generally with disfavor. Meanwhile, it may be interesting to make a note concerning the armament of the new battleships which are now completing for service, being the *Ostfriesland, Thüringen,* and *Helgoland.* These ships are to complete their trials in the autumn. They are more powerful than their predecessors, and fairly complete details of them should shortly be made public. It is already known that they carry twelve 12-inch guns arranged on the same plan as the 11-inch guns of the *Nassau,* that is to say, in six barbettes, of which two on the middle line, and two on either side. For secondary armament they will have fourteen 5.9-inch quick-firing guns in a central battery. For fore and aft fire they will have available six 12-inch and four 5.9-inch, while the broadside will be eight 12-inch and seven 5.9-inch. The cost of the armament of the *Helgoland* class is 19,000,000 marks as compared with 13,000,000 marks in the four ships of the *Nassau* class.

THE "FRIEDRICH DER GROSSE."—With the launch of the battleship of this name, formerly known as the *Ersatz Heimdall,* which took place at the Vulcan Yard, Hamburg, June 10, the thirteenth German so-called *Dreadnought* is in the water, and also the last ship of the program of 1909. She carries as her main armament twelve 12-inch guns in six barbettes, arranged on the plan of the 11-inch guns of the *Nassaus.* The ship has been about 19 months on the stocks, and is to be completed for service in June next year. The ships of the same program are the *Oldenburg,* launched by Schichau at Dantzig last June, and *Kaiser,* launched at Kiel in March, as well as the battle cruiser *Goeben,* launched also last March by Messrs. Blohm & Voss at Hamburg. The last *Friedrich der Grosse* was a single-screw turret ship launched at Kiel in 1874. She had the then respectable displacement of 6770 tons and steamed at 14 knots. Her armament comprised four 10.2-inch and two 6.6-inch breech-loaders. The contrast between the two ships is the mark of the enormous progress which has taken place within the intervening time. The old *Friedrich der Grosse* disappeared from the lists about the year 1907, after having long served as a harbor hulk. Field-Marshal von der Goltz, who delivered the baptismal oration, said that for her journey along the paths she has chosen Germany needs the strong fleet created by the foresight of the Imperial War Lord.—*Army and Navy Gazette.*

The *Rivista Marittima* publishes the following information concerning German ship yards:

(a) The Krupp yards—a stock company with establishments at Essen, Engers, Neuweid, Sayn, Rheinhausen, Friemersheim, Aunen, Magdeburg, Buchau, and Kiel. The yard at Kiel constructs government ships. It

has four large covered ways. The battleship *Posen* and the cruiser *Cöln* are being built there.

Ordnance and armor are manufactured at Essen which has as branches the Polygons of Meppen and Tangerhütte. On November 1, 1909, as many as 36,288 hands were employed in these establishments.

The Krupp coal mines employ 10,888 hands, the iron mines, 4699, the factories at Rheinhausen, 3723, making a total of 66,363 hands for the Krupp group. In 1909, these plants produced warships to the extent of 26,000 tons.

(b) The Schichau plants at Dantzig and Elbing are under the direction of Herr Ziese, son-in-law and successor of Schichau. The ship yards at Elbing construct torpedo-boats. The battleships *K. Barbarossa, Wettin, Elsass* and *Schlesien* were built at Dantzig and the large battleship *Ersatz Frithjof* is being built there.

The Schichau yards at Dantzig have four covered ways long enough for the overall length of the *Dreadnought.*

These establishments employ more than 10,000 workmen and produced in 1909 warships to the extent of 6100 tons.

(c) The stock company "Vulcan" of Hamburg builds ships and engines; has ship yards at Bredow near Stettin where the battleships *Brandenburg, Weissenburg, Preussen* and *Rheinland* were built; employs 9000 workmen; has also a new yard on the Elba where the *Ersatz Heimdall* is being built; contains four large open ways; built in 1909 warships to the extent of 6100 tons.

(d) The Howaldt ship yard at Kiel constructs naval and mechanical material; is building the *Helgoland,* which will be ready by the summer of 1911. Its way has sufficient capacity for the *Dreadnought* type.

(e) The ship yard of Blohn & Voss at Hamburg is the largest in Germany; built the *Kaiser Karl der Grosse,* but specializes in the construction of armored cruisers, having built the *Friedrich Karl, York* and *Shamhorst;* is now completing the *Von der Tann,* which will be ready by next summer; launched last month the *Moltke;* the cruiser *H* is now on the ways and work on the cruiser *I* will presently be begun; has five ways for the construction of the largest ships and employs from 5500 to 8000 workmen.

(f) The Weser Company at Bremen has built a number of small cruisers, besides the battleships *Westfalen* and *Thüringen* (more than 18,000 tons; the *Thüringen* is nearly finished); has two large ways and about 4000 hands; produced in 1909, 18,500 tons.

BRAUCHT DEUTSCHLAND EINE SCHLACHTFLOTTE?—"Does Germany need a fighting fleet?" This question was recently raised by a pensioned German Army officer, Capt. Hartwig Schubart, to whose arguments we have already drawn attention. Briefly, they are summed up in the belief that the new fleet withdraws money from the army, and that the number of British *Dreadnoughts* is determined in the German Reichstag. To this officer Capt. Dr. Fritz Roeder replies in the *Neue Militärische Blätter,* of which he is now the editor. The conversion of Germany from a mainly agricultural to a mainly industrial country, depending upon imports to no small degree for her food and raw materials, the growth of commerce and the growth of population, are the reasons for the creation of a great fleet. It must be made impossible to blockade the German coasts, and the defence, based chiefly on Heligoland, must be capable of being converted into an offensive defence. Captain Roeder says it is obvious that the German fleet has no hostile purpose towards Great Britain. His arguments follow closely the line of thought expressed in the preamble of the Navy Law. No fleet must be a menace to the security or prosperity of Germany. Granting freely the need of her fleet to Great Britain, the editor of the *Militärische Blätter* insists that the need to Germany of her fleet is just as great. "Forty years ago we had to reckon only with an The war of the future will demand a settlement by battle both by land

enemy on land, and not to protect possessions worth millions at sea. and sea. That is why Germany requires a fighting fleet as well as an army."—*Army and Navy Gazette.*

PERSONNEL OF THE GERMAN NAVY.—Coming now to the *personnel* of the German fleet, it is interesting to note that simultaneously with the growth of the ships of the fleet, the German Admiralty has been careful to provide for the necessary increase in the numbers of officers and men to man them. For the last few years something like over 3000 officers and men have been added annually.

The numbers of the officers of different ranks on the active list of the fleet last year were: 4 admirals, 8 vice-admirals, 19 rear-admirals, 84 captains, 199 frigate- or corvette-captains, 461 captain-lieutenants, 1055 lieutenants, 398 midshipmen, and 185 naval cadets. This showed an increase over 1909 of 2 rear-admirals, 4 captains, 10 frigate- or corvette-captains, 27 captain-lieutenants, and 52 lieutenants.

The staff of the marine battalions was as follows: 1 colonel, 2 battalion commanders, 11 captains, and 36 first and second lieutenants. The marine field-artillery have 2 captains, 2 first-lieutenants, and 4 lieutenants, and the pioneer detachment, 1 major, 2 captains, and 1 first-lieutenant.

The engineering department consisted of 12 chief engineers and senior staff engineers, 75 staff engineers, 119 senior engineers, and 192 engineers, being an increase of 35 over the numbers of the previous year.

The medical department consisted of 1 medical director-general, who ranks with a rear-admiral, 4 inspector-generals, 64 senior staff surgeons, 91 staff surgeons, and 113 surgeons and assistant-surgeons, being an increase of 15 over the numbers of 1909.

In the accountant department were 43 staff-paymasters and 173 paymasters, an increase of 9 over previous year.

The seamen's, boys', dockyard and torpedo divisions numbered as follows:

664 chief warrant officers, 1249 warrant officers, 8 bandmasters, 216 chief petty officers, 3815 first-class petty officers, 5723 second-class petty officers, 8364 leading seamen, 25,092 seamen and stokers, 96 boys' petty officers, 1554 boys.

These were distributed among the different divisions in accordance with the following table:

	Chief Warrant Officers.	Warrant Officers.	Bandmasters.	Chief Petty Officers.	1st Class Petty Officers.	2d Class Petty Officers.	Leading Seamen.	Seamen.	Petty Officers for Boys.	Boys.	Total.
Seamen's Divisions..	158	236	8	118	1,436	1,931	4,139	12,417	....	....	20,443
Boys' Division	....	....	....	....	....	....	....	....	96	1,554	1,650
Dockyard Divisions:											
Engine-room *Personnel*..... ...	344	690	....	....	1,413	2,120	2,148	6.447	....	....	13,162
Other Ratings.....	40	81	....	2	385	577	431	1,292	....	....	2,868
Torpedo Divisions:											
Seaman *Personnel*....	25	49	..	36	206	309	700	2,099	....	....	3,424
Engine room *Personnel*.....	97	193	....	....	465	696	946	2,837	....	....	5.234
Total 1910.....	664	1,249	8	216	3,815	5,723	8,364	25,092	96	1,554	46,781
In 1909.....	629	1,182	....	207	3,583	5,374	7.810	23,428	96	1,554	43,871
Increase 1910 ...	35	67	8	9	232	349	554	1,664	....	....	2,910

There was an increase over 1909 of: 35 chief warrant officers, 67 warrant officers, 9 chief petty officers, 232 first-class petty officers, 349 second-class petty officers, 554 leading seamen, 1664 seamen, etc., showing a total increase of 2910.

The seamen artillery divisions and mining detachment numbered 30 chief warrant officers, 61 warrant officers, 3 bandmasters, and 3892 petty officers and men, of whom 15 chief warrant officers, 30 warrant officers, and 800 petty officers and men belonged to the mining detachment. There was an increase of 3 chief warrant officers, 7 warrant officers, and 283 petty officers and men over the previous year.

The marine infantry numbered 199 non-commissioned officers and 982 men. The sick bay staff consisted of 574 petty officers and men of various grades, and there were 380 ships' stewards, writers and assistants. The sum total of all ranks was 57,170, being an increase of 3431 over the number for 1909.

Personnel.	Officers.	Doctors.	Non-Commissioned Officers and Seamen.				Total all Ranks, 1910.	Increase compared with 1909.
			Warrant Officers.	Petty Officers.	Seamen.	Boys.		
Naval Officers	1,872	....	....	....	....	....	1,872	94
Junior Executive Officers	....	....	....	398	185	....	583	....
Engineer Officers	401	....	....	....	....	....	401	35
Seamen, Boys, Dockyard, and Torpedo Divisions	....	....	1,913	9,762	33,456	1,650	46,781	2,910
Seamen Artillery	....	....	91	549	3,346	....	3,986	293
Marine Infantry	50	....	...	210	1,153	....	1,413	2
Personnel of the Clothing Department	2	....	....	27	150	....	179	2
Medical Department	....	273	....	244	330	....	847	47
Artillery Administration	93	....	127	68	....	....	288	14
Torpedo *Personnel* (Technical and Administrative)	61	....	145	59	....	....	265	15
Mining *Personnel* (Technical and Administrative)	30	....	46	71	....	....	147	6
Accountant Department	...	....	91	230	59	....	380	17
Surveying Department			28	....	....	....	28	....
Total	2,509	273	2,441	11,618	38,679	1,650	57,170	3,431
	2,782		54,388					

From the "Etat für die Verwaltung der Kaiserlichen Marine auf das Rechnungsjahr, 1910."

There are two so-called *marine inspektions,* one at Kiel and one at Wilhelmshaven. Each is under a rear-admiral, as inspector. Included in these *inspektions* are the seamen and dockyard divisions, each of which are commanded by a captain. The seamen's division are divided into battalions; the so-called dockyard divisions consist in the main of the engine room and stoker *personnel.* In the torpedo divisions are included both the seamen and engineering *personnel.*

The educational and training department is under a vice-admiral, who has supervision over all the sea-going and shore establishments; his headquarters are at Kiel. There are four sea-going cadet and boy training ships, which make foreign cruises during the winter, returning in the spring; new batches of cadets and boys being embarked each October. The present sea-going training ships are the large cruisers *Freya, Hertha, Victoria Louisa* and *Hansa.* The Naval Academy, which is at Kiel, has a rear-admiral for its director, and is the superior school for the navy, its courses being attended by commissioned officers. The naval school for cadets is also at Kiel, its director being a captain. The school for

engineers and warrant officers is at Wilhelmshaven, and the training ship for seamen is at Kiel.

Naval cadets are selected once a year—in April, the day of selection being fixed by the inspector of naval instruction, to whom the names of candidates must be sent in for approval, together with the required certificates, between August 1 and the 1st of the following February. Candidates must pass an entrance examination if they only possess a certificate showing that they are fit to be in the first class (6th form) of a German *gymnasium,* a *real-gymnasium,* or a Prussian *Ober-real-schule.* Candidates, however, who have obtained a "leaving certificate" from one of the above-named schools are accepted without entrance examination, as are also cadets from a military cadet corps school, on presenting a certificate that they have passed the army ensign examination. All candidates must have received the predicate "good" for English. The age limit is from 17 to 19. The names of candidates are submitted for approval to a committee of three or more naval officers appointed by the inspector of naval instruction. The whole period of training lasts some three and a half years, at the end of which time their names are sent in for election as officers of the Imperial Navy.

The men for the navy are drawn for service as for the army. Of the annual contingents, one-third belong to the seafaring or semi-seafaring population of the Empire, and two-thirds are landsmen. For the navy the service is divided as follows:

Active service (beginning with 20th year)	3 years.
Naval reserve	4 years.
Seewehr (corresponding to the *Landwehr* in the army)—	
First levy	5 years.
Second	7 years.

There are in addition the Naval Ersatz Reserve, which is composed of men of the seafaring population, and also a *Landsturm* as in the army, which includes all those not drawn for the navy from the 17th to the 45th year.

Volunteers are also taken for three, four, five and six years; and boys between the ages of fourteen and a half and eighteen, who join for long service and are trained to become warrant or petty officers, and leading seaman. These boys form the ships' boys' division (*Schiffsjungendivision*), and about 600 are entered at the beginning of April of each year at Friedrichsort, where the school is, near Kiel. Boys desirous of joining the ships' boys' division must apply in person between May 1 and February 1 to the commander of their *Landwehr* district, or to the commander of the division of Friedrichsort. These boys are sent to sea for cruises in the seagoing training ships as the cadets are. They are required to serve for nine years, but can remain on for longer.

The gunnery training establishment (*Inspektion der Schiffsartillerie*) is fixed at Sonderburg, on the Schleswig-Holstein coast to the north of Kiel. The inspector is a rear-admiral. Attached to the shore establishment are the seagoing training ships, consisting of the battleship *Schwaben,* the armored cruiser *Prinz Heinrich,* with the small cruisers *Undine, Stuttgart, Danzig,* and for experimental purposes, the armored cruiser *Prinz Adalbert.* The artillery school on shore is in charge of a captain. The coast artillery and mining establishments (*Inspektion der Küsten-artillerie und des Minenwesens*) is located at Cuxhaven. The inspector is a rear-admiral. For mining instructional purposes there are attached the special service ships *Pelikan, Nautilus* and *Rhein.*

It has to be admitted that simultaneously with its growth, the German Navy has made giant strides in its efficiency. Nowhere is this efficiency more displayed than in their torpedo service, the handling of German destroyers and torpedo-boats under all circumstances of wind and weather leaves little to be desired and reflects the greatest credit on officers and men.

We may add that the total amount of the estimates voted for last year amounted to £21,704,411, being an increase of £1,736,382 over those for 1909. In the German estimates the money for pensions, public works, etc., are not shown, as they appear in another part of the Budget, so it is difficult to make a true comparison between our own naval estimates and those of Germany.

In conclusion, as showing the growth of the Germany Navy during the last ten years, it may be as well to place on record the answer recently made in Parliament by Mr. McKenna, in reply to question, to the effect that since 1905, while we had added only 500 men to the *personnel*, Germany had added 17,000; and that while in our construction there had been an increase of only 16 per cent, in Germany the increase had been 166 per cent.—*United Service Magazine.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Colossus	20,250	Scotts (Greenock).	Under trial.
Orion	22,500	Portsmouth.	Launched Aug. 20, 1910.
Monarch	22,500	Armstrong.	" Mar. 30, 1911.
Conqueror	22,500	Beardmore.	" May 1, 1911.
Thunderer	22,500	London (Thames Iron Works).	" Feb. 1, 1911.
Ajax	23,500	Scotts (Greenock).	Building.
Audacious	23,500	Cammell, Laird & Co.	"
Centurion	23,500	Devonport.	"
King George V	23,500	Portsmouth	"
Armored Cruisers.			
Lion	26,350	Devonport.	Launched Aug. 6, 1910.
Princess Royal	26,350	Vickers.	" Apr. 29, 1911.
Australia	18,800	Brown & Co.	Building.
New Zealand	18,800	Fairfield.	Launched July 1, 1911.
Queen Mary	26,350	Palmer (Jarrow).	Building.
Cruisers.			
Blonde	3,400	Pembroke.	Under trial.
Active	3,400	"	Launched Mar. 14, 1911.
Amphion	3,400	"	Building.
Dartmouth	5,250	Vickers.	Launched Feb. 14, 1911.
Falmouth	5,250	Beardmore.	" Sept. 20, 1910.
Weymouth	5,250	Armstrong.	" Nov. 18, 1910.
Yarmouth	5,250	London & Glasgow Co.	" Apr. 12, 1911.
Southampton	5,400	Brown & Co.	Building.
Dublin	5,400	Beardmore.	"
Sydney	5,400	London & Glasgow Co.	"
Chatham	5,400	Chatham.	"
Melbourne	5,400	Cammell, Laird & Co.	"

PROGRESS OF WARSHIPS AND MACHINERY UNDER CONSTRUCTION IN ENGLAND.—Under a similar heading to the above, on January 13 of the current year, we recorded the progress made in the previous six months. Of that made in the same class of work in the past half year we have to report as follows: The full-power trial of the battleship *Neptune*, built at Portsmouth, not having been concluded at a first attempt—on account of thick weather—was subsequently completed with excellent results, a mean of 27,721 shaft horse-power being generated by her propelling machinery, giving a speed of 27.78 knots. The vessel afterwards carried out her acceptance trials most satisfactorily, and is now out of hand. Laid down on January 19, 1909 she was completed and out of hand

on the 19th of the same month of the current year, just two years from the date of her commencement.

A beginning was made with the construction of the new battleship *King George V*—to be built at Portsmouth—on January 16, and it is hoped she will be ready for launching next September. She will be 564 feet in length, with a beam of 90 feet, have an engine power of 31,000 horse, which is to give her a speed of 21 knots. A large quantity of material is already prepared for her construction, and she is now making excellent progress. The battleship *Orion,* also built at Portsmouth and launched last August, is being well advanced towards readiness for trial, all her propelling machinery being fitted in its place on board and ready for steam.

The cruiser *Blonde* (sister ship to the *Blanche*), built at Pembroke Dockyard, underwent her steam trials in a very satisfactory manner early in March, after which she returned to the dockyard to be completed ready for commission. The cruiser *Active*—of the *Blonde* type—whose launch was fixed for February 27, was not put into the water until March 14, at which date all the principal fittings of the after part of the vessel were completed, with the exception of the propellers, which are to be shipped when the vessel is in dock. Her turbine propelling machinery is only now being put on board, and her trials are not expected to take place until October. The cruiser *Amphion,* a replica of the *Active,* was laid down on March 15, when work was at once proceeded with; very satisfactory progress has been made with her, and she is expected to be launched in October.

The *Lion* is making rapid progress at Devonport Dockyard, the underwater work is completed and work in the engine and boiler rooms well advanced and ready for the powerful turbines with which the vessel is to be fitted. The three great funnels and the twin rudders are in position, the placing of the latter having been the heaviest job of the kind ever accomplished at the dockyard, as each rudder weighed many tons. The new battleship *Centurion,* which had her keel plate laid on the slip—lately occupied by the *Lion*—on January 16, is having her construction advanced at a rapid rate, material having been previously collected so that the progress of work should not be hindered. The vessel will be 564 feet long, with a beam of 89 feet, and a displacement of about 24,000 tons. By May material to about half her launching weight had been built into her hull, so that she may probably be ready to take the water in September next.

Turning now to the progress made in England during the past six months by our private shipbuilders of warships and makers of their machinery, we note that the cruiser *Weymouth,* built by Sir W. G. Armstrong, Whitworth & Co., at the Elswick shipyard, and launched last November, is now ready for her trials. The super-*Dreadnought Monarch* also for the British Government, was launched on March 30, and her propelling machinery is now practically all on board. A training cruiser for the Chinese Government, which was laid down early in the year, is now completely plated, and will be launched in September. Work on the Brazilian battleship *Rio de Janerio* has been suspended for some months, but substantial progress will be made in the near future.

During the past half year Hawthorn, Leslie & Co., Limited, have submitted for trial three 27-knot destroyers, the *Nemesis, Nereide* and *Nymphe,* built at their Hebburn shipyard, and all have been accepted by the Admiralty—the *Nemesis* on March 7, the *Nereide* on April 6, and the *Nymphe* on May 18. With reference to the building of these vessels, it is to be noted that notwithstanding a 13 weeks' stoppage of work in the shipyard due to labor troubles the contract delivery date—April 13, 1911—for all three ships was only exceeded in the case of the *Nymphe.* The boilers for the cruiser *Weymouth,* made at Hawthorn's have been steamed at "moorings," but the official trials have not yet taken place, the main

contract for her machinery being with the Parsons Marine Steam Turbine Company. The boilers, uptakes, and funnels of the battleship *Monarch,* also made at Hawthorn's works, were all fitted on board previous to the vessel's launch on March 30, this being the first occasion on which a battleship has been put afloat with all superstructures, such as funnels, etc., already erected in place. The turbines for the vessel being also on board, it is anticipated that the steam trials will take place in October. The boilers of the *Active*—sister ship to the *Blanche*—are now fitted on board, and the turbines for her are now being forwarded from St. Peter's to the ship. The boilers also of the 27-knot destroyers *Jackal* and *Tigress,* building at the Hebburn shipyard, are quite finished, and preparations for testing the turbines for them are being made in the shop. The boilers for the Chinese cruiser building at Elswick—a combination of the Yarrow and cylindrical types, made at Haythorn's, are quite finished and ready to be put on board, while the Parsons turbine machinery of 6500 shaft horse-power—constructed at the same works—is well advanced in the shops, so that the vessel will, in all probability, be put into the water in a couple of months. The machinery and boilers of the new battleship *Centurion*—now building at Devonport—are also well forward in Hawthorn's workshops. The boiler installation for the new cruiser *Amphion*—under construction at Pembroke—an exact repeat of that being fitted in the *Active,* has been ordered of Hawthorn's, the contract for the machinery of the vessel having been placed with the Parsons Marine Steam Turbine Company.

Very good results having been obtained on the preliminary official trials of the battleship *Hercules,* built and engined by Palmer's Shipbuilding and Iron Company, of Jarrow, during the full-power trial on February 28, a speed of 21.5 knots an hour was easily attained, the turbine engines making 335 revolutions a minute, giving a shaft horse-power of 28,700. The *Hercules* is Palmer's first turbine-driven battleship, and both the Parsons turbines and the large tube Yarrow boilers supplying the steam were built at Jarrow. The ship after the trials returned to the Tyne to complete, and subsequently—on June 16—arrived at Sheerness from the builders, ready for commissioning. The keel of the battleship *Queen Mary* was laid at Jarrow on March 6; she will have an overall length of about 725 feet, with a beam of 87 feet and at her designed water draft a displacement of about 27,000 tons. Her turbine machinery is to drive four shafts, and will give her a speed of not less than 28 knots. On the full-power trial a shaft horse-power of 75,000 may be expected. Steam is to be supplied to the engines by 42 water-tube boilers, so that the propelling machinery as a whole will represent the largest horse-power ever put into a steamship, whether naval or mercantile.

Yarrow & Co., Limited, of Scotstoun, have since the beginning of the current year completed and delivered the twelve of their type of water-tube boilers fitted with their superheaters constructed for the cruiser *Yarmouth.* The two torpedo-boat destroyers *Archer* and *Attack* are still under construction, and have not yet been launched. The torpedo-boat for the Danish Government is practically finished, and will be running her trials shortly. The machinery for the torpedo-boat destroyer, which the Portuguese Government is building in Lisbon, is still in hand in the shops. The triple-screw motor-boat, 60 feet long by 9 feet beam, built for service in Buenos Aires, has been launched, and will shortly be tried, and the two twin-screw motor-boats for the governor-general of Bagdad, together with a shallow-draft launch, 75 feet long by 11 feet 6 inches beam, for a foreign power, have been completed and delivered. Since the end of last December Yarrow & Co. have received an order from the British Admiralty for three destroyers. These vessels are 255 feet long by 25 feet 7 inches beam, and will be propelled by twin-screws driven by Parsons turbine, steam being supplied by three Yarrow water-tube boilers of the latest type.

J. I. Thornycroft & Co., Limited, of the Woolston Works, Southampton, have since the end of last December completed and delivered the four destroyers *Larne, Lyra, Martin* and *Minstrel,* built by them. All these vessels have a length of 240 feet, a beam of 25 feet 3 inches, a water draft of 7 feet 9 inches, and a displacement of 780 tons. They are all triple-screw boats propelled by turbine engines of 13,580 horse-power, which in the case of the *Larne* and *Lyra* give a speed of 28.72 and 28.88 knots, and in that of the *Martin* and *Minstrel* 29.32 and 29.62 knots respectively. There are now in hand at the Woolston shipyard two other vessels of the same type, but only twin-screws, the *Acheron* and *Ariel,* but of slightly increased dimensions, each being 251 feet 9 inches long and 26 feet 4 inches beam, with a draft of 9 feet 3 inches, and 800 tons displacement; their twin-screw turbines are of 15,500 horse-power, and will give them a speed of 29 knots. The *Acheron* has just been launched.

Cammell Laird & Co., of Birkenhead, now that the lock-out of the shipyard workers is at an end, report progress since in warship work as follows: The destroyers in hand for the British Admiralty are proceeding satisfactorily. The turbine propelling machinery for the cruiser *Blonde* has been completed, and the vessel, as was stated elsewhere, has undergone her trials. The first two of the four torpedo-boat destroyers built for the Argentine Government are undergoing trials, and the other two are well advanced. Satisfactory progress is being made with the hull and machinery of the lately ordered battleship *Audacious* for the British Government, also that of the cruiser *Melbourne* for the same power.

The shipyard and engine works of Vickers, Limited, at Barrow, are still as busy as they well can be. The big ship, the *Princess Royal* battleship, was successfully launched on April 29. Being a sister ship to the *Lion,* built at Devonport, she has a length overall of 700 feet, a beam of 88 feet 6 inches, and a draft of 27½ feet, at which immersion she will displace 26,000 tons. She is fitted with turbines of Parsons type, of 70,000 horse-power, which are expected to give her a speed of fully 28 knots. In the hope of being able to deliver the vessel next May, a strenuous effort is being made by her builders, who have quite an army of workers engaged in her construction. The protected cruiser *Dartmouth,* built by the same firm, and launched on February 14, is 430 feet between perpendiculars, 49 feet beam, and 55,000 tons displacement, at a draft of 16½ feet. Her Parsons turbines are to drive four shafts, the expected speed of the vessel being at least 25 knots. The ship has a continuous double bottom, sub-divided for the storage of oil fuel, and her protective deck, which extends the full length of the vessel, covers completely her machinery, boilers, magazines, and all vital parts. The naval airship—which has been very much discussed of late—was successfully launched at Barrow on May 22. She is 512 feet in length overall, with an extreme beam—over her flat sides—of 48 feet. The lifting power is full 21 tons, and she is propelled by two eight-cylinder motor engines, which, when the airship is under way, make 500 revolutions a minute. She has been designed to float on water or to fly in the air, and thus differs from any airship previously built as this one has been, for army or navy purposes.

The progress in warship work effected since the end of last December at the shipyard of the Thames Ironworks Company at Canning Town, and its engine factory at Greenwich, is as follows: The 27-knot destroyer *Nautilus,* built and engined by the firm, has passed through her official trials and attained a speed of 27 knots on "the mile" run at Skelmorlie. The progress made on the *Thunderer* battleship since her launch on February 1 has been very rapid, all the main machinery and boilers having been put in place since the vessel was berthed at Dagenham. The engine works of the company at Greenwich are now busily engaged on the propelling machinery of the "second-class cruiser" *Chatham,* now building at Chatham dockyard. This vessel is 453 feet long overall, has a beam of 49 feet, a draft of 16 feet, and a displace-

ment of 4820 tons. Her propelling machinery consists of Parsons turbines driving four shafts, one high-pressure ahead and one astern on the wing shafts, and one low-pressure ahead and one astern on each center shaft. Twelve water-tube boilers of Yarrow type, in three stokeholds, supply steam; the machinery develops 25,000 shaft horse-power, and gives a speed of about 27 knots. There is also under construction at the company's shipyard at Canning Town a steam launch for the colonial vessel *Australia,* the propelling engines of which are on the Werry principle, the invention of an Australian resident. They are of the horizontal compound twin-screw type, and consist of one high and one low-pressure cylinder, each fitted with two pistons, with steam inlet at the center and at each end of the cylinders. The center inlet is common to both pistons, and drives them in opposite directions, the return stroke being effected by admission of steam to both end ports simultaneously. Alternative admission and exhaustion is effected in the usual way by means of slide valves. Each piston in one cylinder drives, by means of the usual connecting rod, a crank shaft on the opposite side of the vessel, whose revolutions are kept in unison by means of a cross-coupling shaft and geared wheels.

The Parsons Marine Steam Turbine Company, of Wallsend-on-Tyne, has in hand the machinery for two special class destroyers, the *Badger* and *Beaver;* also that for the battleship *King George V,* under construction at Portsmouth, and for the cruiser *Amphion,* building at Pembroke, but the particulars of this machinery are not at present available.—*The Engineer.*

PROTECTED CRUISER CONSTRUCTION.—The announcement that the *Falmouth* has finished her trials successfully draws attention to the progress made with the construction of these later vessels of the city class. The *Falmouth* is the first of the four authorized in 1909-1910 to be ready for her steam trials. She was laid down on February 21, 1910, and has therefore been nearly sixteen months under construction. The *Dartmouth,* of the same program, was laid down two days previous to the *Falmouth,* and the *Weymouth* and *Yarmouth* in January, 1910, so that once again it is shown that it is not always the first vessel to be laid down or launched that is the first to be ready for sea. The rate of progress made with the *Falmouth,* however, does not compare any too favorably with that of the five original cruisers of the city class. The *Bristol* and her sister ships were laid down from one to two months later in the year than the four *Dartmouths,* yet by June, 1910, three of them had completed all their trials. From the date of laying down to the date of commissioning, these five vessels occupied on an average eighteen and a half months, the *Newcastle* being built in seventeen months, and the *Bristol,* fitted with a new type of turbine, in twenty-one months. As we have shown, the four ships of the *Dartmouth* type have already been in hand for sixteen months or more, and only one has actually reached the trial stage. For the four ships to be completed and commissioned in the same average time as their five predecessors, they ought all to be quite finished by the end of August. It is significant that the four *Dartmouths* occupied a comparatively longer time on the stocks than the vessels of the first batch, the average time from the date of laying down to the date of launch being eleven as compared with seven and a half months. Date of launch alone is not, as Mr. McKenna said, a decisive test of a vessel's progress, but when a whole class takes about half as long again to build and launch as a preceding class of similar design, the fact is worthy of note. Has the heavy armored ship programme of 1909-1910 anything to do with this apparently slower rate of construction of the cruising ships?—*Army and Navy Gazette.*

SCOUT CRUISER "DARTMOUTH."—The scout cruiser *Dartmouth*, built by Messrs. Vickers, Ltd., has completed her trials, which proved highly successful. The new vessel is a protected cruiser 430 feet long, of 5250 tons displacement, and carrying eight 6-inch breech-loading guns. She is propelled by Parsons turbines developing 22,000 shaft horse-power. This power was easily gained without pressing the boilers, and she steamed almost 26 knots. Her designed speed was 24¼ knots. The fuel consumption was well under 1½ pound per shaft horse-power per hour.—*Page's Weekly.*

The battleship *Hercules*, launched from Messrs. Palmer's yard, Jarrow, in May last year, has been completed in advance of her contract time, and delivered to the Admiralty. The *Hercules* will not, however, take part in the forthcoming naval review, but, after running 24 hours acceptance trials, will proceed to Sheerness and then to Portsmouth, where, after taking in stores, she will be commissioned on July 16.—*Page's Weekly.*

SMOOTH WORKING OF NUCLEUS CREW SYSTEM.—Much gratification has been felt and expressed in naval circles at the extraordinarily smooth manner in which the nucleus crew ships were this year mobilized and demobilized. The old fuss and furore to get ships' complements on board, and the ships away to sea, has been gradually decreasing since the introduction of the, at first, much-abused Fisher system of nucleus crews. We previously had skeleton and nucleus crew systems on paper, but they were not to be compared with the present system which the drafting authorities at the three great naval ports—Portsmouth, Devonport and Chatham—have now got into such smooth running order. Not many years ago the columns of the daily press were full of luminous, and sometimes woefully inaccurate, description of the movements of bluejackets and marines on the day that the vessels of the old fleet reserve were mobilized for summer maneuvers. To-day even more vessels have their crews brought up to the authorized standard, and are sent to sea for exercises and maneuvers with so little bustle that scarce a note of comment appears in the press, except, perhaps, a short wire to say the thing has been done. But apart from the spectacular point of view, naval men know how much more efficient and ready for battle are the ships that are now raised from nucleus crews to the standard complement, than were those turned out from the old-time fleet reserve, with their machinery and their guns in anything but working order, and their crews needing quite a month to get themselves and their weapons into fighting trim.—*United Service Gazette.*

DEMOCRACY AND THE OFFICER QUESTION.—Speaking at Oxford recently, the Secretary of State for War said "that the German democracy would doubtless follow its rulers to war, as would in all probability the democracy of England, but both democracies were more and more influencing the policy of their rulers." This is also our view, and we sincerely hope that the fact will be kept prominently before that section of the rulers who are charged with the upkeep of the British Army and Navy, and that before an economic power that is every day growing stronger creeps on and overwhelms them in their lethargy, they will take steps to ensure that the levelling up of the officer question is attended to. The democracy of England will follow its *leaders* undoubtedly, but it cannot follow them if it has not got them. There should be no confusing of the term *ruler* and *leader* in the military sense, and it should be remembered that war is essentially a military operation, and that hitherto economic measures have followed on that operation only. The aristocracy in England to-day are refusing to work the military machine on the lines that it was worked when there was no democratic strength in the land, and undoubtedly the

latter class are exercising a very strong influence on the policy of their rulers; before long they will demand a complete change in the methods of providing officers for the services, more especially those of the army. The science of war is of so advanced a nature at the present time that it entails long and arduous study and physical endurance. The democratic body have demanded that this physical toil shall be undertaken, but their rulers have not yet seen the wisdom of advising them that it must be paid for. Will they do this whilst there is yet time and opportunity of adjusting all that is good in the existing military system of this country, or will they drag on until a complete upheaval removes all that is so necessary to true leadership, and lets into the higher ranks men who are absolutely useless as leaders of men?—*Army and Navy Gazette.*

As Sir Joseph Ward remarked the other day, the launch of the cruiser-battleship *New Zealand* from the Fairfield Company's yard at Govan was an occasion of historical interest, not only for the people of New Zealand, but for the Empire generally. He was satisfied, he said, that men in all parts of the Empire were realizing the absolute necessity of establishing some system or structure, some council of defence, or some Parliament of defence, which would be above and beyond party and clear of all local interests, and would enable all portions of the British Empire to co-operate in consolidating and maintaining the Empire.

The first warship given to the Imperial Navy by any of the oversea dominions, the *New Zealand* is a sister ship to the *Australia,* which Messrs. John Brown & Co. are building at Clydebank for the Australian Government. Both vessels are almost similar in design and armament to the British ships of the *Indefatigable* type. Fitted with Parsons turbines, she is expected to attain a speed of over 27 knots, and her main armament of eight 12-inch guns is so disposed that all of them can be fired on either broadside and six fore or aft. She will have a powerful secondary armament consisting of sixteen 4-inch guns.

The *New Zealand* is the largest cruiser hitherto constructed on the Clyde. She has a length of 555 feet between perpendiculars; beam, 80 feet; draft, 26.5 feet; and displacement 18,750 tons. Her thickest side armor is 7 inches. She will carry a crew of 900 men, and her carrying capacity for fuel is 3000 tons of coal. Her launching weight was 8500 tons.

The launch was marked by two presentations. Mr. Alexander Gracie, chairman of the Fairfield Company, presented Lady Ward with a silver-gilt casket containing the axe used by her in connection with the launch of the vessel, and a plaque, made of copper from Nelson's flagship *Victory* and *Foudroyant,* was presented to the Fairfield Company, to be hung in their board-room as a souvenir of the launch from the colleges and schools of the Dominion of New Zealand.

For the installation of her machinery a new electric titan crane of 200 tons lifting capacity will be employed. The crane is the work of Sir William Arrol & Co.

H. M. S. *Acheron,* a torpedo-boat destroyer of the special type, included in the 1910-1911 program, and built to the design of Messrs. John I. Thornycroft & Co., Ltd., was launched a few days ago from their Woolston Works, Southampton. She has a length of 251 feet 9 inches between perpendiculars, and a breadth of 26 feet 4 inches. The propelling machinery consists of a twin set of turbines of the Parsons type, designed to give a speed of 29 knots, steam being supplied by three large water-tube boilers fired by oil fuel. The armament consists of two 4-inch and two 12-pounder guns, and the vessel also carries two torpedo-tubes. It is noteworthy that this is the first to be launched of the six special destroyers ordered in the Admiralty program of last year, and the vessel

is also the first destroyer to be fitted with a two-shaft arrangement of turbine machinery. Messrs. Thornycroft have a sister vessel, H. M. S. *Ariel,* on the stocks, which is also in a forward state of completion and will be ready for launching very shortly.

Speaking at Birmingham a few days ago Sir Joseph Ward said he was sorry that his ideals of an Imperial Parliament had not been accepted by the conference. He was not surprised, however, because it was a matter on which public opinion had to be educated, and certainly the Dominions opinion was tending in that direction. Under such a scheme the Dominions would be able to contribute their share towards the naval defence of the Empire. His country was now paying nine shillings a head; another was only paying four shillings, but if a uniform payment of ten shillings could be fixed, the Dominions would be paying their fair share towards supporting the navy. Fifty more *Dreadnoughts* could then be laid down to-morrow without costing the ratepayers of the Mother Country another penny. He was no Jingo, but such a navy would be the greatest guarantee for the world's peace that could be conceived.—*Page's Weekly.*

H. M. BATTLESHIP "HERCULES."—Palmers' Shipbuilding and Iron Company, Limited, Jarrow-on-Tyne, are to be congratulated on the successful completion of the *Hercules,* which has passed through her final acceptance trial, and was handed over to the Admiralty June 15, a fortnight before the contract date of completion, July 1 of this year. This performance is the more remarkable as the vessel is the largest yet added to the British fleet, and as operations were considerably hindered during the progress of the work, owing to labor troubles extending over three months; it is also indicative of the satisfactory character of the facilities at the builders' works, and of the organization of the staff under Mr. A. B. Gowan. Another feature of note is that the ship has been twice in the dry dock at Hebburn-on-Tyne, now controlled by the Palmers' Company, a fact which shows that its dimensions suffice for the modern battleship under normal conditions of loading. The *Hercules* has a length of 510 feet, with a beam of 85 feet, and on a draft of 27 feet the displacement is almost exactly 20,000 tons. Yarrow boilers have been fitted, and the Parsons turbine installation has the usual arrangement of four shafts and four propellers. On her final steaming trials, as reported, the vessel developed 28,700 shaft horse-power, and the speed was over 21½ knots. There are ten 12-inch guns mounted in pairs in five barbettes, and so disposed that all may fire on either broadside; because, although the two barbettes in the center of the ship are placed on the beam, they are in *échelon,* and the deck erections have been disposed to enable them to fire on either broadside with very satisfactory arc of training forward and abaft each beam. The disposition of the sixteen 4-inch guns is so that many of them are fairly well protected. The vessel has a main water-line belt of 11 inches, and over this a further strake of 8 inches, while the barbettes are of 11-inch armor, and the gun-hoods are also 11 inches in thickness. Forward there is additional protection above the main strakes. The thickness, however, is reduced forward and aft, first to 4 inches, then to 3 inches, and ultimately to 2½ inches. It may be added that the *Hercules* is the eleventh battleship constructed by the Palmers' Company, the immediately preceding ship being the *Lord Nelson,* completed in 1908. At present the firm have on hand the armored cruiser *Queen Mary.*

NEW SHIPS.—Mr. Burgoyne asked on the 31st ult., whether provisional dates had yet been fixed for the launch of the capital ships *King George V, Centurion, Audacious, Ajax,* and *Queen Mary.*

Mr. Kenna: The actual dates have not yet been fixed, but it is expected that the ships will be launched in the following months: *King*

George V, October, 1911; *Centurion*, November, 1911; *Ajax*, December, 1911; *Audacious*, January, 1912; *Queen Mary*, February, 1912.

Mr. Falle: Is the *Queen Mary* called after the Queen Mary of history, in which case the nickname of the sailors on board that ship is easy to guess, or is it called after the gracious Consort of his present Majesty?

The Deputy-Speaker: The question does not arise.

THE SPEED OF DESTROYERS.—The decision of the Admiralty to increase the designed speed of some of the boats of the 1910-1911 program will not create any surprise. In view of the speed of the last few German destroyer programs, especially those which are turbine-driven, such a step was but natural. In his paper on turbines at the recent meeting of the Institution of Naval Architects, Sir Charles Parsons reminded the members that the marine turbine was first introduced into a German destroyer towards the end of 1902, when the S 125 was ordered to be fitted with it. Soon after this boat was completed, another new destroyer, G 137, having double the engine power of the S 125, was fitted with turbines designed for 30 knots, although 33.08 knots was attained on a three hours' run. Since then every destroyer has been turbine-driven, and the German Admiralty have adopted other types besides the Parsons turbine, especially those of German design. Although the designed speed remained at 30 knots, several of the boats in the 1907-1908 and 1908-1909 programs reached between 33 and 34 knots on trial. In the twelve boats authorized in 1909-1910, the designed speed was increased to 32.5 knots. The speed provided for in British destroyers during this same period has varied in the opposite direction, the *Tribal* class, the last of which were authorized in 1907-1908, and which were designed for 33 knots, being followed by the *Beagle* class, designed for 27 knots, and by the *Acorn* class, with the same designed speed. A designed speed of 27 knots is also provided for in the fourteen destroyers of last year's program designed by Sir Philip Watts, but the remaining seven will have higher speeds. The *Archer* and *Attack*, designed by Yarrow, will have a speed of 28 knots; the *Acheron* and *Ariel*, by Thornycroft, 29 knots; the *Badger* and *Beaver*, by Parsons, 30 knots; and the *Firedrake*, *Lurcher* and *Oak*, also designed by Yarrow, 32 knots. It will be seen, therefore, that we are still somewhat behind the German boats in the matter of speed, providing, of course, that the trial conditions are the same in both cases. It would also appear, from the recent appearance of the second destroyer flotilla, that there are occasions when it is inexpedient to drive the boats at the full speed given them. It would be interesting, in view of what happened to the *Acorn* class boats, to learn why there is such a great difference in the trial conditions of the British destroyers, as it has always been said that what was relinquished in speed in the *Acorn* type was compensated for by seagoing qualities.—*Army and Navy Gazette.*

AEROPLANES FOR THE NAVY.—All naval men will appreciate the patriotic action of Mr. Barber in presenting the government with four Valkyrie monoplanes with a view to encouraging aviation in the services. It is hoped that two of these machines will be allotted to the navy, as they are fitted with combination floats and wheels to allow them to rise from or descend upon either land or water, and are, therefore, specially adapted for use afloat. At last, therefore, the navy may have an opportunity, even though in a small way, of testing the value and uses of the aeroplane on machines of its own. We have constantly advocated such a condition of things believing that, notwithstanding the decision of the advisory committee on aeronautics two years ago—by which the army was allowed to experiment with the aeroplane as well as the non-rigid airship, and the navy only the airship of the rigid type—naval officers should be given the opportunity of determining for themselves to what extent the heavier-than-air machine could be of assistance to them in their profession. There are two reasons why this should be done, first, because the officers

selected for training in aviation at Eastchurch have shown themselves quick to pass the necessary tests in order to qualify themselves for pilots' certificates; and secondly, because naval opinion in many countries inclines to the belief that, equally with the airship, the aeroplane will be of value for scouting purposes. Up to the present the naval airship at Barrow had not been seen in flight, though Mr. McKenna last week was sanguine about an early appearance. But the aeroplane has developed rapidly during the two years it has been under construction, as recent events show. No fewer than eleven competitors in the great race known as the European Aviation Circuit succeeded in crossing the Channel.—*Army and Navy Gazette.*

THE NAVAL AIRSHIP.—Mr. Burgoyne asked on the 31st ult., why the naval airship *Mayfly* had been rehoused without flight, and when it was expected she would really be available for effective service.

Mr. McKenna: The naval airship No. 1 was taken out of the shed in order to carry out certain experiments which could not be done inside. The ship will not be ready for service until she has been accepted from the contractors.

Mr. Burgoyne: In view of all the circumstances, will the right honorable gentleman consider the advisability of changing her name from *Mayfly* to *Might-Have-Flown?*

Mr. McKenna: Both names are the invention of the honorable gentleman.

THE NAVAL AIRSHIP.—In reply to a question asked in the House of Commons recently it was stated that the naval airship at Barrow would be ready for her trials at the end of July, but there seems every reason to believe that it will be some time in August before she again emerges from her shed. Various alterations are being made in the airship with the view of making her as efficient as possible when her trials, which are to be exhaustive, take place. Much interest is centered in the ship and in the possibilities of her success. Her designers are sanguine she will achieve all they claim for her. The problem has been solved that she can float safely, which means that she can land safely on water wherever her captain may wish to alight. It is probable that even army airships will have to be provided with reservoirs in which to alight so as to prevent accidents which have frequently happened when they have alighted on land. However, the Barrow airship is regarded much as an experiment, but her designers and builders are so sanguine of her success that they believe she will be the beginning of a fleet of airships to be used in connection with the navy. The Vickers' firm have had great experience in the building of this ship, which will be valuable in the future.—*The Marine Engineer and Naval Architect.*

A NEW CONNING-TOWER.—The position of the conning-tower in our new battleships has for a long time been looked upon by naval officers as having been made obsolete by various innovations in warship building during the last few years, but chiefly by the new method of mounting our primary guns. The blast from these weapons has become something more than inconvenient to all whose duty would, in action, expose them to its stunning effects. The all-round slit between its roof and sides which formed the outlook through which the captain fought and the navigator navigated the ship, is large enough to cause inconvenience from blast, and still more inconvenience from the shell fire of an enemy who was able to shoot straight and rely on his fuses to explode his shell. For the first time we are to have, in the battleship-cruiser *Lion*, a conning-tower so designed as to protect the officers who are inside, from either of the above dangers, and yet arranged on a plan that will give a good all-around view to those whose important

duties require that they should have a free field of observation in every direction. There are still the funnels and superstructure to obstruct the view in certain arcs of the circle, but in these arcs gun-fire from the primary guns is not possible, so that the new conning-tower meets all present requirements. When the funnelless motor battleship arrives the new conning-tower will still meet the altered conditions, and afford its occupants more protection than the present one. It is smaller, and therefore not so likely to be hit by hostile fire, and it is situated just above the foremost super-imposed barbette. Naval officers are pleased with the innovation.

BRITISH MANUFACTURERS OF NAVAL WAR MATERIAL.—The productive capacity of the private establishments of the United Kingdom for building and equipping warships and manufacturing guns, gun mountings, machinery, and the like has been the subject of much discussion. We append, therefore, a list of the principal firms engaged in government work. As all the large contractors sub-let to smaller makers of specialities, etc., the list is not complete, but to add the names of the many firms assisting in Admiralty work would take up more space than we can spare. It has been calculated that the capacity of the private firms for building, arming and completely equipping vessels of the *Dreadnought* type is not less than eighteen at the same time. With some little addition to the facilities for gun-mounting production, this number could be increased to twenty. There are ten private docks in the United Kingdom capable of taking ships of the *Dreadnought* type, and two more under construction.

Messrs. Armstrong, Whitworth & Co., Elswick, Walker, Scotswood, Oppenshaw and Erith.—Shipbuilders, gun, gun mountings, armor-plate and ammunition manufacturers. Fifteen building slips. Warship output for 1909: British, 4800 tons; foreign, 6200 tons. Total employees, about 25,000. British ships in hand: *Conquerer,* battleship; *Newcastle* and *Dartmouth,* cruisers. Estimated capacity of firm: three *Dreadnoughts* complete within two and a half years from date of order, with three more each 15 subsequent months.

Messrs. Vickers, Sons & Maxim, Barrow, Sheffield, Birmingham, Crayford, Dartford and Erith.—Shipbuilders, gun, gun mountings, armor-plate and ammunition manufacturers; makers of marine engines. Area of Barrow shipyard, 100 acres, employing nearly 10,000 men. Twelve building slips. Warship output for 1909 (excluding submarines): British, 24,050 tons; foreign, 19,500. British ships in hand: *Vanguard* and *Princess Royal,* battleships; *Liverpool* and *Falmouth,* cruisers; several submarines. British machinery in hand, for battleships *Vanguard* (completed), *Lion* and *Princess Royal;* for cruisers *Liverpool* and *Falmouth.* Estimated capacity: three *Dreadnoughts* complete within three years from approval of design, with one more every six months following.

Messrs. Beardmore & Co., Dalmuir, Parkhead and Mossend.—Shipbuilders, gun, gun mountings and armor-plate manufacturers; makers of marine engines. Seven building slips. Area of Dalmuir shipyard, 90 acres. Warship output for 1909: British, 4800 tons. British ships in hand: *Monarch,* battleship; *Gloucester* and *Weymouth,* cruisers; also machinery for these ships. Estimated capacity for output of armor-plates, 10,000 tons per annum.

Messrs. John Brown & Co., Clydebank and Sheffield.—Shipbuilders, armor-plate manufacturers, makers of marine engines. Nine building slips. Area of Clydebank shipyard, 80 acres; of Atlas Works, Sheffield, 40 acres. Warship output for 1909, 2760 tons (British). British ships in hand: *Bristol,* cruiser; *Beagle, Bulldog, Foxhound, Acorn, Alarm* and *Brisk,* destroyers. British machinery in hand, for *Indefatigable,* cruising battleship, and *Yarmouth,* cruiser. Estimated capacity for output of armor-plates, 8000 to 10,000 tons per annum; for armor, forgings, cast-

ings, etc., 100,000 tons per annum; and for marine engines, 80,000 independent horse-power per annum.

Palmers' Shipbuilding and Iron Company, Jarrow.—Shipbuilders and makers of marine engines. Six building slips. Area of works, 100 acres, employing 8000 men. Warship output for 1909, 1620 tons (British). British ships in hand: *Hercules,* battleship; *Viking,* destroyer.

Fairfield Shipbuilding and Engineering Company, Govan.—Shipbuilders and makers of marine engines. Area of works, 85 acres. Warship output for 1909, 5720 tons (British). British ships in hand: *Glasgow,* cruiser; *Grasshopper, Mosquito, Scorpion,* destroyers. Machinery in hand, for *Bellona,* cruiser (completed). Two Colonial destroyers are also in hand.

Scotts' Shipbuilding and Engineering Company, Greenock.—Shipbuilders and makers of marine engines. Ten building slips. Area of works, 40 acres. Warship output for 1909, nil. Ship in hand *Colussus,* battleship. Machinery in hand, for *St. Vincent,* battleship (completed).

Messrs. Cammell, Laird & Co., Birkenhead, Grimesthorpe and Sheffield.—Shipbuilders, armor-plate and projectile manufacturers; makers of marine engines, constructors of floating docks, etc. Seven building slips, five graving docks. Warship output for 1909, 840 tons (British). British ships in hand: *Swift, Racoon, Renard, Wolverine,* destroyers. One floating dock. Machinery in hand, for *Blonde,* unarmored cruiser. Estimated yearly output of armor, 10,000 tons; of gun forgings, 5000 tons; with 100,000 projectiles.

London and Glasgow Shipbuilding Company, Govan.—Shipbuilders, makers of marine engines. Six building slips. Area of shipyard and works, 20 acres, employing 3000 men. British ships in hand: *Yarmouth,* cruiser; *Rattlesnake, Chameleon, Comet* and *Goldfish,* destroyers.

Thames Ironworks Shipbuilding and Engineering Company, Poplar.—Shipbuilders and makers of marine engines. Six building slips. Area of works, 26 acres. British ships in hand: *Thunderer,* battleship; *Nautilus,* destroyer.

Messrs. Swan, Hunter and Wigham Richardson, Walker and Wallsend-on-Tyne.—Shipbuilders, makers of marine engines, dock constructors. Sixteen building slips. Area of works, 78 acres. Ship in hand: *Hope,* destroyer.

Wallsend Slipway and Engineering Company, Wallsend-on-Tyne.—Makers of marine engines and warship machinery. Area of works, 25 acres. One graving dock, two slipways. British machinery in hand, for *Orion,* battleship; *Newcastle,* cruiser; *Hope,* destroyer.

Coventry Ordnance Works, Coventry and Scotstoun, Glasgow.—Manufacturers of guns, gun mountings and ammunition. Total number of men employed (when in full working): Coventry, 6000; Scotstoun, 2000. Also gun-proving ground, with range of 25,000 yards, at Boston.

Messrs. Firth & Sons, Sheffield.—Makers of projectiles and other warship equipment. Area of works, 41 acres, employing over 2000 men. Total producing capacity, 40,000 tons of steel per annum.

Hadfield's Steel Foundry Company.—Makers of armor, projectiles, etc. Largest manufacturing capacity for common and armor-plate projectiles in the world. Weekly output: above 6-inch caliber, 800 rounds; 6-inch caliber, 2000; under 6-inch caliber, 7000 to 10,000 rounds.

Messrs. Thornycroft & Company, Woolston, near Southampton.—Builders of torpedo craft and machinery. Warship output for 1909 (British), 860 tons. British ships in hand: *Savage, Larne, Lyra, Martin* and *Minstrel,* destroyers.

Messrs. Yarrow & Co., Scotstoun.—Builders of torpedo craft and machinery. Building slips, eight. Area of works, 12 acres, with an additional 12 acres reserved for extensions. Warship output for 1909 (foreign), 3570 tons. British work in hand: Machinery for *Rattlesnake,* destroyer.

Messrs. J. S. White & Co., East Cowes.—Builders of torpedo craft and machinery. Warship output for 1909 (British and foreign), 3000 tons. British ships in hand: *Basilisk, Harpy, Redpole, Rifleman* and *Ruby,* destroyers.

Messrs. Hawthorn, Leslie & Co., Hebburn-on-Tyne.—Builders of torpedo craft and machinery, makers of marine engines. Area of works, 50 acres. Output of warships in 1909 (British), 1330 tons. British ships in hand: *Zulu, Scourge, Nemesis, Nereide* and *Nymphe,* destroyers. British machinery in hand, for *Conqueror,* battleship, and *Collingwood,* battleship (completed); *Blanche,* unarmored cruiser.

Messrs. Denny & Bros., Dumbarton.—Builders of torpedo craft and machinery, makers of marine engines. Warship output in 1909 (British), 1150 tons. British ships in hand: *Pincher, Sheldrake* and *Staunch,* destroyers.

Messrs. A. and J. Inglis, Pointhouse, Glasgow.—Shipbuilders and marine engineers. British destroyer in hand, *Fury.*

Messrs. Harland & Wolff, Belfast.—Shipbuilders and marine engineers. British machinery in hand, for battleship *Neptune.* Number of employees, 12,000.

Parsons' Marine Steam Turbine Company.—Marine engineers. Area of works, 23 acres. British machinery in hand, for *Dartmouth,* cruiser.

What is claimed to be a world's naval gunnery record was recently made, according to letters received at Portsmouth, by leading seaman Russell, of the flagship *Minotaur,* on the China station. Firing six rounds from a 7.5 gun, he scored five hits and one ricochet hit in 31.8 seconds. The returns of gun-layers' tests from the squadron thus far mark an improvement on the record of last year, when it headed all the British fleets in average score.

THE NAVAL OFFICER OF THE FUTURE.—Referring to the recent examination at Portsmouth of fifty-four midshipmen who constituted the first group of entrants under the new system of training for naval officers to establish their fitness for passing into the service first as sub-lieutenants, and after two years' further training as lieutenants, *Engineering* says that the occasion is historically interesting, and also of great importance, because it affords an opportunity to once more determining whether the new system will ensure a supply of officers to take up such specialized work as steam engineering, gunnery, torpedo, and electrical work. An analysis of the situation, too, is opportune at this stage, as it is possible now so to modify the original program as to the remaining proportion of the training to be devoted to special practical work, as to rectify any error which may have been made in the course so far pursued. We think a fair case can be made out for such an amendment, and that a review of the situation will demonstrate the necessity that sub-lieutenants, who are to take up the duties of the steam engineering officers, should at once pass into that branch, and concentrate their study upon practical training in the construction and repair of machinery and boilers.

Before stating the case in favor of such earlier specialization than was originally intended, our contemporary thinks it well to glance at the underlying motive and principle of the new scheme, and to inquire how the idea has been worked out in the case of the fifty-four youths who reached the transitional stage. The principle of common entry, on which the new system is based, has much to commend it. Although indefensible, a spirit of caste has crept into the service—a social distinction has been drawn between the military and the engineering branch. While there has been no failure mutually to recognize unity of purpose, professional worth, and personal character in the case of the officers of any department of the service, yet the irrefutable claims of the engineering officers to equality of rank and status with their confreres have been denied by

military officers with such unreasonable pertinacity as to justify the belief that the opposition is inspired by the spirit of caste.

Tired with their efforts to break down this widespread feeling, those in authority resorted to the establishment of the new scheme of entry, in the expectation that time would rectify the error. There can be little doubt about this being the dominant motive in those who introduced the present system, and in itself it is to be commended. But there was at the same time the greater reason for doing justice to the present engineering officers of the service, and until this is done the action must be regarded as only partly successful.

But the main consideration is as to the principle and prospective efficiency of the new scheme. It will be conceded that as a theoretical knowledge of physics, chemistry, and applied mechanics, now constitutes a great part of the training, the officer of the future, irrespective of the branch of the service in which he is ultimately to be placed, will prove more resourceful. The function of a sound education is to create a hunger for practical knowledge, to develop the mind in order to assimilate that knowledge, and to cultivate the ability of applying knowledge to useful work. *Engineering* can conceive of no better medium for achieving these desiderata than the tackling of engineering problems, and consequently the authorities will be commended in direct proportion to the extent to which engineering has been made the basis of the general training of the midshipmen who are now about to pass into the service. They have already laid a common foundation of knowledge, and from this will flow the advantage that in action one officer of a given rank may more easily replace his colleague hors de combat. It must not be forgotten, however, that the principal function of the warship is to win actions, and although the machinery, and particularly the boilers, under modern conditions, constitute a vital factor in the fulfilment of this aim, each branch—navigation, gunnery, torpedo, electrical and steam engineering—plays its important part, and needs to be in the hands of men having the highest expert knowledge and skill. The efficiency of any department must not be attained at the cost of the others.

But when these arguments in favor of common entry and training have been acknowledged, there remains the important question as to the period at which specialization should take place in the case of officers who are destined to serve in one or other of the special branches. Upon this question the whole success of the new scheme, and its effect on the efficiency of warship management, absolutely depends.

In the recent past the torpedo and gunnery work has been passed over to the military officers, and in their case a special training in the *Excellent* has followed upon their usual general education. However, satisfactory from the point of view of the management of torpedoes and guns, these courses were usually deficient in the extent to which specialized knowledge was imparted, notably in physics and applied mechanics. There is, therefore, every reason to believe that the study of engineering will ensure a higher efficiency in the case of those who specialize in gunnery and torpedo work, particularly, if as is certain, the sub-lieutenants who elect to enter these departments of the service are called upon to add to the practical knowledge already obtained a special course in the gunnery or the torpedo school.

In the case of the engineering officers there is not the same certainty of improved efficiency. Keyham College proved an admirable school for the training of the engineering student, and the four or five years served there, while it may not have given the same extent of sea-time as under the new system, certainly produced an engineer with an intimate knowledge of the mechanism which, when in service, he was called upon to maintain in the highest efficiency. The youth on leaving Keyham had undoubtedly that hunger for practical knowledge and that acquaintance with machinery which may be taken as a proof of sound mechanical

training. Nor, so far, is there much to cavil at in connection with the new midshipmen. The fifty-four who were recently examined were between twenty and twenty-one years of age, and began their training in September, 1903. They spent two years at Osborne College and two years at Dartmouth College, going afloat then for six months in the cruiser *Cumberland,* and subsequently they were appointed to vessels of various types in commission. While at sea they had to continue their studies under the direction of specialists on board, and it was provided that one-third of their time should be devoted to engineering. Several of the engineering officers who had these midshipmen under their charge admit that their attitude towards their work was satisfactory. They were required to perform the same functions as the youths who underwent training at Keyham under the old system, and had experience of watch-keeping. The opinion, however, heard on all sides is that none of the midshipmen liked the engineering work, and this fact is somewhat significant in view of the hope that a sufficient number of these midshipmen will volunteer as entrants in the engineering branch of the service to make up the necessary additions to the personnel. The work in the engine room is not always agreeable, and does not afford the same opportunities for social enjoyment as is the case with the military work. Nor is the income as great when special allowances are taken into account. Under the present system, however, even the fifty-four students who recently sat for their examination are not called upon to volunteer for any branch until two years hence, so that it is not necessary now to consider to what extent the failure of volunteering will necessitate compulsory selection for each branch.

It is opportune, however, concludes *Engineering,* to inquire whether emendation is desirable on the course originally provided for the training of these officers. It will be conceded that as the midshipmen enter upon their service, under the new system, at seventeen years of age, instead of twenty years of age, as with the Keyham students, there is a gain; but against this there is the fact that only one-third of the time afloat between 17 and 20 years of age under the new system is devoted to engineering. Even then, their service is without much responsibility, and probably, also, without a clear understanding as to the why and wherefore of many things which puzzle even the most active mind. Moreover, the lack of continuity is not conducive to concentration. It would therefore be well for those in authority seriously to consider whether the midshipmen who are successful in the recent written tests and oral examination should not be called upon to specialize at once, in order that they may, before their minds and characters have passed the plastic age, and come into continuous and direct contact with the work they will ultimately be responsible for. The period between the ages of 20 and 22 years is of the highest importance in the development of resource, and there is little need to enforce the view that then concentration is of vital importance. Our opinion is that a great part of these two years should be spent at Keyham College and factory, in order that a fuller and more intimate experience should be acquired as to mechanical engineering generally. Indeed, we are satisfied that if this amendment were made to the scheme, a large part of the widespread doubt as to its general result would be dissipated.—*United Service Gazette.*

THE AUSTRALIAN FLEET.—According to the Commonwealth Minister for Defence, the immediate defence policy of the Australian Government is to carry out the work agreed upon at the Defence Conference of 1909 —that is, to provide the unit there laid down, comprising one armed cruiser of an improved *Indefatigable* type, three protected cruisers of an improved *Bristol* type, six destroyers of the river class, and three submarines. The contracts for an armored cruiser, two protected cruisers, and two submarines have been placed in Great Britain, and contracts

have been concluded with the government of New South Wales for the construction at Sydney of one protected cruiser, to be named the *Brisbane,* and three destroyers. It is anticipated that the unit decided upon in 1909 will be completed in 1912-1913.—*Page's Weekly.*

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Dante Alighieri	19,000	Gov't Yard, Castellamare.	Launched Aug. 20, 1910.
Cavour.	22,000	" " Spezia.	" Aug. 10, 1911.
Giulio Cesare	22,000	Ansaldo-Armstrong.	Building.
Leonardo da Vinci ...	22,000	Genoa (Odero).	"
Scouts.			
Quarto	3,400	Venice.	Building.
Marsala	3,400	Castellamare.	"
Nino Bixio.....	3,400	"	"

THE ITALIAN NAVY.—The *Popolo Romano* describes the recent discussion arising from the statement of the Minister of Marine as a storm in a tea-cup—or, in the Italian phrase, in a glass of water. All that the Minister has done is to ask for money to maintain the normal relative strength of the navy in accordance with the necessities of modern war. If he had not done so, the Italian Navy, which for a time held the third place among the navies of Europe, but has descended to the fourth, would soon fall to the bottom of the scale. The cost of living is greater, everything costs more, and the navy cannot but increase in cost also. In the course of his speech the Minister said that everyone could sympathize with the desire for brotherhood and perpetual peace, but as practical men they must be prepared. Italy is a maritime country, running out like a mole between two seas, and Italians, while they do not compete with the whale, cannot be content to play the part of sardines in a box. The argument that the expenditure might be reduced because of the alliance with Austria-Hungary would merit more consideration if the Italian Navy had anything other than a friendly relation to that of the Dual Monarchy. The *Popolo Romano* declares that the character of Italy's alliances, the sincerity of her friendships, and her desire to settle great or small differences which might lead to misunderstanding, are the proof of her loyal and pacific intentions. If there is any country penetrated with a sense of the necessity of peace, that country is Italy.—*Army and Navy Gazette.*

CURTIS TURBINES FOR ITALIAN CRUISERS.—The Fore River Shipbuilding Co., at Quincy, Mass., has just shipped from their works to the Officine Meccaniche, Naples, Italy, three of six Curtis turbines for the Italian cruisers *Nino Bixio* and *Marsala.* The turbines were loaded at Quincy on the lighter *Commissioner,* of the Merritt & Chapman fleet, and taken to New York, where they were shipped on the steamer *Perugia,* sailing on July 22 for Naples.

ITALY AND AUSTRIA.—From time to time in these columns attention has been drawn to the situation which exists between the allied countries of Italy and Austria-Hungary. It would be a mistake to attach great political importance to the breezy agitation of the Austrian Navy League or the utterances of papers like the *Danzer's Armee-Zeitung.* Nevertheless, it is interesting to know that the paper just named has just published a long article, introduced by a preface from the pen of Vice-Admiral Chiari, a retired Austrian officer, which is devoted to a demonstration of the decisive importance of victory at sea for the conduct of a great war

against Italy. It is well known that the Italians have created extensive defensive works in Venetia, and that there exists a certain doubt or uncertainty as to the attitude that should be assumed toward the Austro-Hungarian ally. It would appear that articles like that to which we refer cannot but conduce to unfriendly relations. The object is to show that Italy is now so strong in Venetia that the possibility of successful military operations is doubtful, unless there should be a command of the sea, only to be gained by a victory over the Italian fleet. In short, the writer says that a decisive naval victory is the chief factor for success in military operations against Italy. He does not hesitate to say that it should be the object of Austria-Hungary to re-establish her supremacy in Venetia and Northern Italy, and therefore he strongly urged his countrymen to prepare for the day of trial. Even if the past were entirely forgotten, it would be necessary to maintain a sufficient fleet to secure the peace of Austria. "As Frederick the Great said, after the battle of Hohenfriedberg, in 1745, that his best allies were his own troops, so must Austria-Hungary say that the best ally of her army is a superior fleet."—*Army and Navy Gazette.*

NEW ITALIAN DREADNOUGHT "CONTE DI CAVOUR."—Yesterday morning, August 10, 1911, this new battleship was successfully launched at Spezia. Admiral Mirabello's crusade against lack of homogeneousness is beginning to produce its fruits, which began to appear in the *Vittorio Emanuele, Regina Elena, Roma* and *Napoli* type, and in the eight armored cruisers of the *Pisa* class. The former possess good speed and an armament of two 305-mm. and twelve 203-mm. guns; the latter will probably not have their number added to, as opinion has turned in favor of *Dreadnoughts,* of which four were designed by General Masdea.

The *Conte di Cavour* is the second example of these, the first being the *Dante Alighieri,* launched at Castellamare in August, 1910, and the other two the *Giulio Cesare,* in Ansoldo's yard at Sestri Ponente, and the *Leonardo da Vinci,* being built at Odero's at the Foce, both of which are to take the sea next month, and will be completely ready in 1914.

The *Conte di Cavour,* as indeed the other two not yet launched, differ in several points from the *Dante Alighieri,* specially in heavier armor plating—giving them more displacement—and in the elevated turrets adopted after the satisfactory results of the *Minaes Geraes* and the *Michigan.* Their thirteen heavy guns are carried in three turrets for three guns each at bows, stern and amidships, and in two elevated two-gun turrets immediately behind the triple turrets at bows and stern. Their speed of 22 knots gives them 2 knots advantage over ships like the *Arkansas* and *Wyoming,* while the weight of their broadside of big guns is as 0.247 kilos. per ton of displacement, against 0.181 kilos. From the ballistic point of view the *Texas* is also inferior with 0.235 kilos. per ton displacement, and the *English Monarch* is the only one which shows superiority, with her quota of 0.253 kilos. The three new Italian ships have, however, five guns for use in extreme sector firing, against the four guns of the above units. The *Viribus Unitis* class, now being built by Austria, will have, on the other hand, twelve guns of 305 mm. in four three-gun turrets—two of which are elevated—giving them six guns for bow and stern firing, but a lesser broadside weight, and there is much discussion in technical circles as to the respective merits of the two types.

The following are some of the principal details of the *Conte di Cavour:* Length between perpendiculars, 168.96 m.; beam, 28 m.; draft, 8.452 m.; displacement, 21,500 tons; turbines, 24,500 horse-power; speed, 22 knots. There are to be twenty Blechynden type water-tube boilers. The normal coal and petroleum capacity is 1000 tons. The armament will comprise thirteen guns of 305 mm., 46 caliber (weight 64.112 tons, weight projectile 417 kilos.), twenty guns of 120 mm., 50 caliber, and thirteen guns of 76 mm., 50 caliber. There are to be three submarine torpedo-tubes

(two lateral, one stern). The complement will consist of 44 officers and 950 men. A view of the vessel on the stocks is given above.

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Under trial.
Aki	19,800	Kure.	" "
Kawachi	20,800	Yokosuka.	Launched Oct. 15, 1910.
Settsu	20,800	Kure.	" Apr. 1, 1911.
——	24,000	"	Ordered.
Armored Cruisers.			
Kongo	27,000	Vickers.	Building.
Haruna	27,000	Kobe.	"
Kirishima	27,000	Nagasaki.	"
Hiyei	27,000	Yokosuka.	Ordered.
Protected Cruisers.			
Shikuma	5,000	Sasebo.	Launched Apr. 2, 1911.
Yahagi	5,000	Nagasaki.	Building.
Hirado	5,000	Kobe.	"

THE JAPANESE NAVY.—In addition to the battle-cruiser *Kongo,* of 27,500 tons, which Messrs. Vickers are building at Barrow, certain other vessels of the same class are being built in Japan. It has long been known that two others were in hand, but it appears that a third is also to be built. The ship now in hand at the Mitsubishi yard, Nagasaki, has received the name of *Kirishima,* and that at the Kawasaki yard, Kobe, of *Haruna.* The name of the ship to be laid down next month at the Yokosuka dockyard will be *Hiyei.* It is stated that the heavy parts necessary for certain of these vessels have been ordered in England and Germany. The *Kirishima* may be launched at the beginning of 1914, the Mitsubishi Company having taken on 2000 additional workmen for her construction. Three of the vessels, including the one at Barrow, will have Parsons turbines, and one of them a Curtis turbine instalment. There are contrary reports as to the armament of these vessels. One speaks of ten 12-inch guns, another of eight 14-inch guns, and others of various arrangements. In view of this disparity of statements it would be well to distrust any of them.—*Army and Navy Gazette.*

Orders have recently been placed in Japan by the Japanese Government for four new armored ships of the super-*Dreadnought* type. With the battle cruiser laid down at Barrow last January, this makes five super-*Dreadnoughts* in one year.

The new battleship, says the naval correspondent of the *Daily Chronicle,* is to be built in the Imperial Dockyard at Kure, where the 20,800-ton *Dreadnought Settsu* was launched last month. This vessel is stated to have a displacement of over 25,000 tons and to be armed with twelve 13.5-inch guns.

In the Imperial dockyard at Yokosuka, where the *Kawachi,* a sister ship to the *Settsu,* is now nearing completion, is to be built an armored cruiser of 28,000 tons, to be armed with ten 13.5-inch guns. A vessel of similar type is to be built at Kobe and at Nagasaki by the Kawasaki and Mitsubishi Companies respectively. Neither of these concerns has built an armored ship before, but they have signed contracts for the completion of the 28,000-ton *Dreadnoughts* in three years.

JAPANESE NAVAL PROGRESS.—The series of papers read by Japanese delegates to the Jubilee Congress of the Institution of Naval Architects was not only of great interest, but of historical value as well. The first,

by Rear-Admiral Motoki Kondo, dealt with naval construction in Japan, beginning with the building of the *Chiyoda Gata,* the first warship on the European model, and tracing the development from this wooden gunboat of 1862 to the *Kawachi* of to-day. Dealing with the four navy yards, the writer showed that the Yokosuka dockyard, the first sod of which was turned in 1865, but which now employs over 8000 men, had built only third-class cruisers or small craft of less than 3000 tons up to 1904, when the *Satsuma,* of 19,200 tons, was begun. At Kure dockyard, commenced in 1889, the *Tsushima,* of 3366 tons, was succeeded by the *Tsukuba* and *Ikoma,* of 13,750 tons. Although the first armored vessel built in Japan, the *Tsukuba,* was the most powerful armored cruiser in the world when built and until the *Invincibles* were completed. At the present time the Yokosuka yard has in hand the battleship *Kawachi* and a 27,500-ton armored cruiser similar to the ship building at Barrow, while at Kure the *Settsu* is in hand. Of the other two yards, that is Sasebo, near Nagasaki, is completing the *Shikuma,* of 5000 tons, but principally repair work in done here; while the Maidzura yard, the only one in the Sea of Japan, is engaged in building torpedo craft, although equal to heavier work. Japan is fortunate in possessing two large private yards, at Nagasaki and Kobe, and Rear-Admiral Kondo announced that each of these firms has received an order for a battle-cruiser similar to that ordered from Vickers. These private yards built the *Mogami* and *Yodo,* despatch vessels, but have not hitherto undertaken armored ships. Armor plate is supplied from Kure navy yard, where plant was started in 1902, the plates being made by a special process invented by Japanese engineers. Sufficient progress had been made in three years to justify armoring the *Tsukuba* with Japanese plates, and the output is now equal to all requirements.

NAVAL ENGINEERING IN JAPAN.—There were three other papers contributed by Japanese members of the institution, one on the development of mercantile shipbuilding, another on the design and performance of the new Trans-Pacific liners *Tenyo Maru* and *Chiyo Maru,* and one on naval engineering, by Engineer Rear-Admiral Terugoro Fujii, I. J. N. The first-named paper showed the encouragement given in recent years to the shipbuilding industry by the Japanese Government, and how in their turn the private yards are now able to undertake large warship contracts for the Japanese Navy and for other powers as well. The *Tenyo Maru* and *Chiyo Maru* are new liners which burn oil fuel only, but an uncertainty in supplies last year led to some of the boilers being adapted for coal, when it was found that the consumption of coal was 20 to 22 tons against 14 tons of fuel oil. Admiral Fujii's paper contained much important information in a small compass. In regard to turbines, a Parsons installation was tried in the *Mogami* in 1907, and in the same year the Curtis turbine was adopted for the *Aki* and *Ibuki.* The new battleships *Kawachi* and *Settsu* will also have Curtis turbines, as will one of the four new battle-cruisers, but the three other vessels of the latter class, including the one building at Barrow, will be fitted with Parsons turbines. The horse-power to be developed by the engines of these battle cruisers will be 64,000, and they will each have four screws. The last armored ships having reciprocating engines were the cruiser *Kurama,* which was present at the naval review the other day, and the *Satsuma,* battleship. The following paragraph, dealing with the effect of the recent war upon the machinery of the ships engaged, is interesting:

It is gratifying to mention that the machinery of our squadrons had not shown any defects such as to affect the action of our fleet during the whole course of the recent war, and it may be worth mentioning that some of the warships were continuously under steam for over 2000 hours. The only noticeable trouble which our engineers experienced was the leakage of both main and auxiliary condenser tubes. Also I may add that the spare parts of auxiliary machinery were found indispensable, they having been used very often.—*Army and Navy Gazette.*

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I	16,900	St. Petersburg.	Under trial.
Andrei Pervozvannui	16,900	"	Building.
Evstafi	12,500	Nicolaiev.	Under trial.
Sevastopol	23,000	St. Petersburg (Baltic Wks.).	Launched June 24, 1911.
Petropavlovsk	23,000	" "	Building.
Poltava	23,000	" (Admiralty Yd.).	Launched in June.
Gangoot	23,000	" "	" Building
Armored Cruisers.			
Bayan	7,800	St. Petersburg.	Under trial.
Pallada	7,800	"	" "
Protected Cruiser.			
Outchakoff	6,750	Sevastopol.	Building.

The Baltic fleet is to be brought up to its full strength of sixteen battleships by January 1, 1930. The life of a battleship is to be twenty-two years from the date of laying down, four of which are to be spent in building and equipping, twelve with the active fleet, and eight years with the reserve. After this term ships will be struck out of the fleet list altogether. The life of the cruisers is fixed at eighteen years. The cruisers will pass from the active fleet into the reserve thirteen years after laying down; their term in the reserve is fixed at five years. The life of torpedo-boats is fixed at seventeen years. After these terms have expired warships of all classes will be replaced by new vessels. Warships lost through accident are to be replaced at once.—*Page's Weekly.*

A new harbor is to be erected in the Baltic with two dry docks for battleships, one dry dock for cruisers, a floating dock taking 30,000-ton vessels, repair yards, magazines, etc. This new base is to be fortified both on the land and sea side. By 1924, the first year in which the two battleship squadrons will be completed, the new base is to be enlarged, with three more dry docks. By the same year there is also to be created an auxiliary base with stores and magazines. By 1914 Kronstadt is to be reconstructed as a rear base, the existing wharves and workshops are to be put in order, the roadstead is to be deepened, and the battleship dock at present under construction is to be completed.

A similar reformation is to take place at Sevastopol, where there is to be a new dry dock for battleships, and a floating dock of 30,000 tons capacity. The port of Nikolaievsk is to be equipped to be the chief construction base of the Black Sea fleet. It is to have new building slips and a 30,000-ton floating dock. The port of Vladivostok is to be sufficiently equipped for works entailed by the maintenance of the Pacific flotilla. According to this bill, the first squadron of the Baltic fleet, consisting of eight battleships, will be ready by 1918; in 1920 half the second squadron will be ready, the total in battleships then being 12; and in 1924 both squadrons will be ready. The bill does not go into the matter of finance, beyond affirming in the preamble that Russia can afford the money.—*Page's Weekly.*

Some interesting details were given last Friday by the Berlin correspondent of the *Westminster Gazette* concerning the Navy Bill which is to be placed before the Russian Duma next autumn. The bill, it is stated, provides for the reconstruction of the fleet on a large scale, and is upon the German principle of a fixed building program, for a term of years and a fixed period for the replacement of worn-out warships. It gives the exact strength of the Baltic and Pacific fleets, including minor

vessels, and fixes a standard for the strength of the fleet in the Black Sea.

The bill provides that the permanent strength of the Russian fleet in the Baltic shall be two squadrons, each consisting of eight battleships, four armored cruisers, eight cruisers, thirty-six torpedo-boats, and twelve submarines, in addition to which there will be a reserve squadron consisting of superannuated ships. The Black Sea fleet is to consist of one squadron, which is to be kept at a strength one and a half times as great as the naval forces of the other States with Black Sea coasts. The absolute strength is not fixed, on the ground that the future naval strength of the Black Sea States is not known. In this case the Minister of Marine is to ask for credits for building in Budget form from year to year. For practical reasons it is impossible to create a Pacific fleet fit to cope with a probable enemy. The naval forces, therefore, will consist only of two cruisers, eighteen torpedo-boats, twelve submarines, and three counter-mine-ships, with the usual auxiliary vessels.—*Page's Weekly.*

RUSSIA PUTS OVERBOARD HER FIRST "DREADNOUGHT."—Russia's first *Dreadnought Sevastopol,* was launched successfully June 29, 1909 from the Baltic works, in the presence of the Ministry of Marine, naval attaches, a large representation of society, the legislative bodies and officialdom.

The battleship was laid down on June 16, 1909, and it is expected that another two years will be occupied in equipping the vessel. The *Sevastopol* has a displacement of 23,000 tons, and with 42,000 horse-power is expected to develop a speed of 23 knots an hour. Her length is 590½ feet, and the beam is 87 feet. Her armament will consist of twelve 12-inch guns, sixteen 4.7-inch guns and smaller artillery. All of the vessel and its equipment has been or will be built in Russia.

THE RUSSIAN NAVY.—Two Russian battleships, the *Sevastopol* and *Poltava,* have just been launched with perfect success. The length of the ships is 590 feet 6 inches, the beam 87 feet, and the draft 27 feet 3 inches. The displacement will be 23,000 tons, and engines of 42,000 horse-power are intended to develop a speed of 23 knots. The total coal capacity will be 3000 tons, and the capacity of a liquid fuel 1170 tons. The turbines will have four screws, and there will be twenty-five modified Yarrow boilers. As is already known, the armament will consist of twelve 12-inch guns in four turrets and sixteen 4.7-inch guns. The *Petropavlovsk* is to be launched on August 28, and the *Gangut* on October 28. It does not appear that the orders have yet been placed for the three *Dreadnoughts* intended to be built in the Black Sea.—*Army and Navy Gazette.*

SPAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
España.....	15,400	Ferrol.	Building.
Alfonzo XIII.....	15,400	"	"
Jaime I	15,400	"	Ordered.

TURKEY.

FOREIGN "DREADNOUGHTS."—A report from Constantinople states that the final contract for one *Dreadnought* of 21,500 tons was signed on June 14 by the Minister of Marine and a representative of the Armstrong group, with an undertaking that Turkey shall order a second *Dreadnought* from the same group, if and when the necessary credit is voted in part.

It is reported that the Chilian Government are considering tenders for two battleships of greater dimensions than the present *Dreadnoughts*. The two warships will each be of over 30,000 tons, and carry an armament of ten 15-inch guns. They will thus be the most powerfully armored vessels afloat, in addition to which they will possess a speed approximating to that of our present *Dreadnought* cruisers. Tenders for the two ships have been submitted by the principal British shipbuilding firms, as well as from several on the Continent. Some weeks will yet elapse before the contracts will be awarded, but there is every probability that they will come to Britain. The ships will cost nearly two and a half millions each.

UNITED STATES.

VESSELS BUILDING.

No.	Name. *Battleships.*	Speed. Knots.	Where Building.	% of Completion July 1.	Aug. 1.
30	Florida.....	20¾	Navy Yard, New York.	94.3	98.1
31	Utah.....	20¾	New York Shipbl'g Co.	99.2	99.6
32	Wyoming.....	20½	Wm. Cramp & Sons.	68.8	70.8
33	Arkansas.....	20½	N. Y. Shipbuilding Co.	68.4	71.3
34	New York.....	21	Navy Yard, New York.	1.3	2.5
35	Texas.....	21	N'pt News S. B. Co.	19.3	24.8

THE UNITED STATES NAVY.—The battleships of the program of 1911-1912 will mount twelve 14-inch guns in four triple turrets. There has been a great conflict of opinion upon this question, but it is assumed that the Italians are fully satisfied as to the success of the system, and that the Austrians and Russians are acting with full confidence in their own authorities and tests. The merit of such an arrangement does not consist merely in providing for a full broadside for all the guns. The larger advantage, from the constructor's point of view, is that it will place all upon the middle line, and will economize in space for internal arrangements, including the simplifying of magazines and the system of ammunition supply, and will also conduce to economy in the weight of steel. It is further intended that the secondary or anti-torpedo armament shall be more advantageously placed. On the whole, it must be admitted that the triple arrangement possesses considerable merits, and perhaps the only disadvantages are those which were recently pointed out by Sir William White, who doubted the wisdom of putting too many eggs in one basket, and also to the maintenance of rapidity in loading and firing individual guns in such a turret. Constructors, however, have an open mind upon this subject, and are looking forward with great interest to the completion of the ships now in hand.—*Army and Navy Gazette.*

World-wide attention is being attracted to the new wireless towers which are to be erected at Arlington by the Navy Department. The contract for the towers was let on June 20 by the Bureau of Yards and Docks to the Baltimore Bridge Company for $105,000. When complete the plant will cost about $150,000. It will be the largest high-powered station in the world. As stated previously, the top of the highest tower, which will be 600 feet from its base, will be over 200 feet higher above the sea level than the Washington Monument. It is estimated that the station will have a radius of communication of about 3000 miles.

THE "DELAWARE."—The Americans are justly proud of the *Delaware*, and the *New York Sun* states that she is one of the finest *Dreadnoughts* afloat. She will certainly be one of the finest *Dreadnoughts* at the Spithead review. Recently she steamed 17,000 miles—to Valparaiso and back, and her captain reported that she required no repairs, and that her

engines, boilers, ship and *personnel* were in excellent condition, ready for any duty. In order to test the bearings, with 10 boilers out of 14 under forced draft, the ship attained a mean speed of over 20 knots for a short period, everything working well. Comparisons have been made greatly to her advantage with the *Oregon,* which, during the war with Spain, also went round the Horn. But the *Delaware* has almost doubled the displacement, and yet the cost of coal per mile in running her was less than 75 per cent of the cost in the case of the *Oregon.* Just before the *Delaware* sailed from Hampton Roads, on January 31, with the body of the deceased minister from Chile, Senor Cruz, on board, she had completed a voyage of 9000 miles to Europe and back. The Americans are asking if any other great warship in the world has displayed such ability in sustained cruising. The *Delaware* has been prepared at the New York navy yard for her visit to England, and as the *New York Sun* says there will be no finer ship in the line, without doubt she will receive the unaffected praise of foreign naval experts.—*Army and Navy Gazette.*

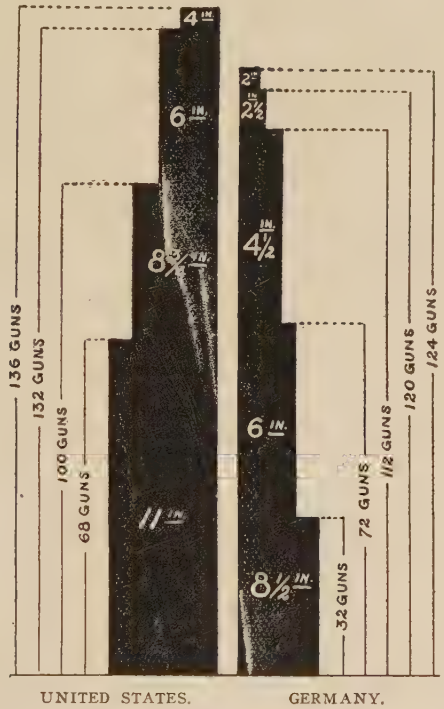
AMERICAN NAVY YARDS.—The subject of navy yard, or, as we should call it, dockyard administration is at present very much alive in the United States, and is really the cause of Secretary Meyer's visit to this country. A special board has been constituted to make recommendations to secure efficiency and to prepare for up-to-date management. There is to be a report on co-ordination of work, the employment of officers and men from the ships on repairs in the yards, and the placing upon naval officers of responsibility for the self-maintenance of the fleet, so that they, and not the navy yards, may determine when work upon ships shall be done at the yards. In this connection attention is to be given to the question of building a completely modern repair ship. Other subjects to be reported on are improvements in the system of accounts, the regulation of work in the yards and of labor in due proportion, rewards for individual merit in work, the advisability of continuing or discontinuing certain classes of work in the yards, and the arrangement of a course of study and lectures on methods in practice in modern management for midshipmen at the Naval Academy. Meanwhile the so-called "Taylor system" of shop management, which originated with Mr. F. W. Taylor, of Philadelphia, is supposed to promise greater economy and efficiency in engineering and other shops. The fear that it may be applied is exciting opposition amongst the employees. Naval Constructor Evans has also written on the subject, and points to the Mare Island yard as a well-managed institution made capable of competing with eastern yards where wages are much lower and the cost of material less.—*Army and Navy Gazette.*

It is announced that the American Navy Department proposes to test "incinerators" on warships. In the recent cruise of the American battleship fleet the slower service ships reported that they had no difficulty in trailing the fighters by the litter which floated in their wake for miles. Experts consider that this is a dangerous condition in time of war, and, therefore, for the sake of covering the trails and for sanitary purposes, incinerators are being tested.—*Page's Weekly.*

A COMPARISON OF THE GERMAN AND AMERICAN NAVIES. By H. D. Brandyce.—One of the most fruitful topics of the day seems to be the phenomenally rapid growth of the German Navy; and the notion is widely held that the Kaiser is adding to his fleet for the purpose of challenging England's age long supremacy on the sea. Now, whatever may be the Kaiser's idea, such a contingency is not likely to be realized for many years to come, for not only is Germany's naval strength still far inferior to Britain's but it is at the moment of writing also vastly less than our own.

BATTLESHIPS SHOWING PENETRATION OF KRUPP ARMOR AT 8000 YARDS.

Herewith is given in graphic form a diagram showing the overwhelming superiority of the American battle fleet in the matter of heavy guns; 68, or exactly half of the total, being 12-inch rifles capable of successfully attacking at 8000 yards the heaviest armor worn by the Germans. On the other hand, not a single one of the Kaiser's ships could at that distance pierce the main belt of any of the Americans, and only 32 of the newest rifles (11-inch, 45-caliber) would be effective against the Yankee topsides.



This diagram shows that the batteries of United States ships have far greater penetrative power than those of the German ships.

In time of stress it is the armored ships that count, and the tables given above demonstrate beyond peradventure of a doubt the present offensive superiority of the United States fleet.

Germany is contemplating equipping her newest *Dreadnoughts* with ordnance of 12.2-inch caliber, but these undoubtedly powerful weapons will be more than compensated for by the new 14-inch rifles which are to be mounted in our *Texas* class, recently laid down. All this, however, is beside the question, as our object has been to demonstrate that at the middle of the year 1911, the German Navy, far from being a menace, is not by any means the equal, offensively, of the fleet that flies the Stars and Stripes.—*Scientific American.*

MARINE ENGINEERING.

FIAT MARINE OIL ENGINE.—The Fiat Company, of Turin, well known as a maker of motor cars, has, of recent years, taken up the manufacture of heavy oil engines. The first engines made were of a light and high-speed type, designed especially for use on submarines, torpedo-boats, or auxiliary craft attached to large warships. On these the experimental work was done, and when their success, particularly as regards reversibility, was assured, larger sizes were taken up, and to-day the company has under construction heavy oil engines to the extent of many thousands of horse-power, both for marine use and for fixed plants on land. The motors are all of the single-acting two-cycle Diesel type, and are made for either high or moderate speed. The number of revolutions of the latter varies between 150 for the 1000 horse-power motor to 300 for the 100 horse-power motor, the weight of the motor with accessories being about 40 to 50 kilos. per horse-power. The number of revolutions of the high-speed type varies between 600 for the 100 horse-power, and 450 for the 1000 horse-power motor, the weight being from 16 to 20 kilos. per horse-power.

An example of the latter is illustrated in *The Engineer*. It is a 600 horse-power motor which makes 500 revolutions per minute. The general arrangement of this motor will be easily gathered from the engraving. The cylinders are all cast separately, and there are no independent scavenging pumps, the main pistons being of two diameters, of which the upper and smaller part forms the motor piston, whilst the lower part works as an air pump. This arrangement permits a marked reduction in the length of the motor and improves the balance. The upper part of the crank chamber serves as a reservoir for the scavenging air which is compressed to about 0.2 to 0.4 atmospheres, according to the number of revolutions. The air is conducted to the scavenging valves through passages cast with the framing and cylinders. There are two scavenging valves for each cylinder placed on the cover with the oil valve and the compressed air inlet valve for starting. The exhaust, as is usual with two-cycle motors, takes place through ports in the motor liner which are uncovered by the piston.

The high pressure compressor is of the two-stage horizontal type, and is driven by an extension of the crank shaft. In front of the motor, and driven by the main shaft at reduced speed, there is a group consisting of the water pump for cooling the cylinders and a lubricating oil pump; this oil is also used for cooling the piston, as water cooling in types of such reduced dimensions would present difficulties and the possibility of inconvenience.

The valve lay shaft is supported by brackets as shown, and is driven by the main crank shaft by means of a vertical shaft and two pairs of helicoidal wheels. The valves of each cylinder are driven by a single angular cam, which receives an oscillatory motion from an excentric keyed to the lay shaft. At one of its two extreme positions this cam opens the two scavenging valves, and at the other lifts the fuel valve. This simple arrangement is made possible by the fact that in the normal distribution of these motors fuel admission and scavenging are 180° of a revolution apart. Hence it follows that to change from forward to astern gear, it is sufficient to change the angle of the excentric on the main shaft, and this change is made by moving axially on the vertical shaft the helicoidal wheel working the horizontal shaft. The displacement is made by compressed air.

The operation of the valves for starting by compressed air is obtained by double-profile cams—one for each cylinder—which are keyed on the horizontal shaft, and which can be moved in the direction of the axis by a small shaft in the interior of the lay shaft itself, which is hollow; the two extreme positions give the movement ahead or astern, and in the center position the valves are closed.

Starting, reversing, and regulating the power and number of revolutions are controlled by means of a lever and handle, which are seen in front of the "maneuvering box," placed near the extremity of the motor. The upper lever serves to displace the helicoidal wheels on the vertical shaft, as already mentioned, and the cams which work the starting valves on the horizontal shaft, whilst the lower handle regulates the stroke of the fuel pump. The working is very simple, and in the official trials made on a motor of this type for the Italian Royal Navy it was found possible to reverse the motor easily in five seconds, starting at full speed.—*The Engineer.*

The French Navy Department, we hear, is contemplating using petroleum residues more extensively for heating marine boilers. The Minister of the Marine is quite in favor of it, and is now engaged in promoting a number of plans which will lead to a more extensive use of this fuel. All the new torpedo destroyers of the navy are, it is said, arranged for firing the boilers with petroleum residues of European origin. At ports such as Toulon, Brest and Cherbourg there are now being installed oil reservoirs in which the petroleum residues will henceforth be stored up, and a steamer to be used specially for oil transport has been acquired by the navy. It will ship oil at Constanza and will then bring it to the French ports and fill up the reservoirs directly. It is also of interest to note, adds the source of our information, that the 26,000-ton battleships *Courbet* and *Jean Bart* of the French fleet, as well as the new units which are to be constructed, will be fitted with the necessary appliances so that they can burn crude oil or residues at the same time as coal, making thus a combination system.—*The Engineer.*

The application of the producer gas plant for marine purposes seems to be making headway. The latest news on this subject comes from Seattle, where a 900-ton three-masted iron barkentine, 185 feet in length with a beam of 32 feet, is being converted for this system of propulsion. There are several interesting points about this vessel. The producer, which is of the up-draft type, is 9 feet in diameter, 10 feet high, and is intended to work on a low grade of lignite costing about 4s. per ton at the mine. The main engine is of the four-cylinder type and will develop 300 horse-power at 200 revolutions per minute. Power is transmitted through a friction clutch to a reversible propeller. The latter is 82 inches in diameter and is of the feathering blade type. The reversal of the propeller blades and the operation of the clutch are pneumatically controlled. The vessel is to be employed for carrying lime in barrels to San Francisco and is fitted with a wireless telegraphy outfit. The total cost of the conversion will, it is said, be about £7000, but it is believed that in less than two years the vessel will have repaid this by her increased earning capacity. A feature of the vessel lies in the fact that in case of fire in the hold where the lime barrels are stored, the exhaust from the engines can be turned into the hold so as to smother the fire in carbon dioxide.—*The Engineer.*

TURBINE-DRIVEN SHIPS.—The subject of the propulsion of ships continues to occupy the attention of engineers to a very marked degree, as is exemplified by a paper read recently before the Liverpool Engineering Society by Mr. J. K. Catterson-Smith, A. M. I. E. E., on the manufacture of turbo-electric generators and some of their applications to marine work. In a recent issue we dealt with the subject from the broad standpoint of the relative merits of toothed gears, hydraulic gears and electric gears, consequently it is unnecessary to go over the same ground again, but we think it may interest our readers if we deal with some points of detail raised by Mr. Catterson-Smith on the matter of electric gears. It must be remembered that up to the present, although the two former

gears have been applied on ships and results have been obtained, there is no record of any example of the latter gear having been installed on shipboard and practically tested. The author claims that the chief advantages of electric drives are: No practical limit to power, electromagnetic gear in place of teeth, simple methods of varying the gear-ratio, maintenance of efficiency over large range of power by sub-division of generators, and no uncertainty regarding operation and durability of plant. Apart from questions of weight and economy, it is absolutely essential that the electric coupling should admit of an extensive range of speed control, together with effective reversing powers for braking and going astern while the vessel is being maneuvered. The types at present available are direct current motors, single-phase commutator motors, and polyphase induction motors, all of which are capable of variable speed control. Direct-current motors would be supplied by direct-current turbo-dynamos, and single and polyphase motors by turbo-alternators. There would appear to be a certain similarity between electric train haulage and ship propulsion, thus pointing to the advantages of propeller motors having such characteristics, although it may be agreed that the characteristics of induction motors would meet the requirements of all vessels except those in which exceptional maneuvering capabilities are required, as the turbine itself is capable of a wide speed range. The direct-current system has important advantages in the matter of flexibility as to speed and torque to meet the requirements of the vessel, while the propeller motor can be of any size if the voltage is increased with the size of the unit. The author cites the case of a rolling-mill motor which was capable of giving 12,000 brake horse-power at 60 revolutions per minute on 880 volts. The speed control of such motors is easily obtained by variable voltage generators, motor field control, or compound winding on the motor field. When the ship is to be stopped, the propeller driving the motors would enable the latter to regenerate and deliver back energy to the main generators, where it would be absorbed by a water-cooled brake, or a steam-blade brake, or the energy could be dissipated by resistances. Although propeller motors of large power present no difficulty, it is found that present-day direct-current turbo-dynamos have a distinctly limiting feature in the matter of providing commutator capacity, and in support of this the author gives some interesting tables and formulæ showing the maximum voltage possible under certain conditions. With regard to polyphase generators, it is pointed out that commercial firms are prepared to construct motors up to 3000 brake horse-power continuous rating. The limitations as to size of this class of motor are not of any serious moment, but whatever they are, the principal difficulty will be with the propeller motors, instead of with the generating sets as in the direct-current system. Dealing now with polyphase induction motors, it is pointed out that this system in various forms is the one most applicable, owing largely to its simplicity. Some interesting particulars are given in the paper of an extremely simple three-phase system recently proposed to the U. S. Government for a battleship. The main machinery was to consist of two 12,000 K. W. three-phase generators, having a maximum speed of 1200 revolutions. Twin screws with two 7000 horse-power motors to each shaft were to be fitted, thus with full load 28,000 horse-power would be transmitted. When at full power the two motors forming one set each have 30 poles, the gear ratio then being $7\frac{1}{2}$ to 1, and under these conditions the speed would be controlled by the turbine speed. For lower speeds one generator and one motor on each shaft would be cut out, leaving the gear ratio the same. For still lower speeds the number of motor poles would be changed to fifty, giving a gear ratio of $12\frac{1}{2}$ to 1, and the turbine be allowed to work over its whole speed range again. Some interesting tables of gear ratio between alternator and motor are included in the paper.—*Marine Engineer and Naval Architect.*

ELECTRIC PROPULSION OF SHIPS.—As is well known, there are many advocates of the use of electricity as a means of propulsion, and from some points of view there is no doubt it has its attractions. The combination of steam turbines and electro-motors offers one solution of the speed reduction problem for propellers.

The Hon. C. A. Parsons considered the chief difficulty would be the danger of leakages and possible short-circuiting, which would, of course, be an added menace to marine engineering.

As we have before mentioned, Mr. H. A. Mavor, of Messrs. Mavor & Coulson, electrical engineers, Glasgow, is a firm believer in the future of electric propulsion. He pins his faith to the alternating-current, and not the continuous-current system, and claims that the only possible solution of the problem for large powers is in the alternating system.

He has recently backed his opinion by constructing an experimental vessel thus equipped, which has been appropriately named the "Electric Arc," not as a facetious individual termed it, the "Electric Ark," although she certainly does enshrine the symbols of Mr. Mavor's faith. The boat was constructed at Dumbarton, and is 50 feet long by 12 feet broad, having a moulded depth of 7 feet 4 inches. The original equipment consisted of a 45 brake horse-power four-cylinder Crossley gas engine operated with producer gas, for which a suitable producer and scrubber were provided. The engine drives a direct-coupled alternating-current dynamo or generator, with its exciter. From this generator the current passes to an alternating-current motor, which is in its turn coupled direct to the propeller. This system offers two advantages. One is that the switch system may be operated either from the engine room or from the bridge; the other is that the engine and generator shafting need not be in alignment with the motor propeller shafting, and thus engine-room space may be more economically made use of. In this experimental vessel only one engine and propeller were used; she is for short trips on coastal service.

Gas is supplied from the producer on the suction principle to the engine, which is coupled to an alternating-current generator. The continuous-current exciter is driven by belting from the engine shaft, and is mounted upon the top of the generator. The alternating-current motor is a multiple-wound machine in which there are two independent windings, the current is alternating three-phrase, and the motor is extremely simple in construction.

There are no brushes, and no slip rings. The novelty of Mr. Mavor's invention lies in the arrangement of the stationary conductors and the method of supplying them with current.

Control of the motor is through two simple switches. One of these controls the excitation of the generator-magnet, and by its means the supply of current from the generator to the motor can be regulated from zero to maximum.

The second switch is interlocked with the first, so that it can only be put into operation when the current is shut off. This switch controls the direction of the current supply to the motor in one or both of its windings, and by this means gives either slow or full speed, ahead or astern.

Mr. Mavor claims that the increase of efficiency attainable by making the motor revolutions suit the propeller and the generator revolutions suit the engine is considerable, and no doubt he is right in this. It is especially true perhaps at lower speeds than the maximum of which the ship is capable.

The system was tested as a whole, and has made a 15 hours' non-stop run with the gas producer and gas engine; but for investigation purposes it has been considered desirable to take out the producer plant and gas engine and install a petrol motor of the same power.

The vessel was tested in the Gareloch at the end of May, and attained a speed of 8¼ miles per hour. We do not learn much from that fact, but perhaps more important was the test of the control of the ship. The

switches were connected to an ordinary Chadburn telegraph instrument, with chain connection to the main switch in the engine room. The control of the engine was thus in the hands of the navigator on the bridge, and a feature of the trial was the ease with which the vessel could be made to go ahead or astern. The demonstration also included running the vessel with power on one winding of the motor and on two. One circuit alone gave two-thirds of the speed with two.

A number of maneuvers were carried out, including stopping, starting and speed changing, and gave great satisfaction. The method of control used dispenses with resistances and auto-transformers for regulating voltage supply to the motor, the only resistance required being in the exciter circuit, where the current is comparatively small, and the necessary resistances simple and compact. The trial proves the mechanical possibilities of the scheme. What we want to know now is the relative weights of producer, scrubber, engine, generator, and motor, as compared, say, with a petrol engine directly coupled to a propeller, and suitable for giving the boat the same speed. It would also be interesting to know the comparison between the weights of machinery according to Mr. Mavor's plan and those of a vessel fitted with water-tube boilers and turbines. On the surface it appears likely that the weights would be heavy, but no doubt Mr. Mavor, as a result of this experiment, will be able to make a close estimate of these particulars.—*Army and Navy Gazette.*

At the summer meeting of the Institution of Mechanical Engineers of Great Britain, in Zürich, during the last week of July, a paper was read on "Modern Diesel Oil Engines," by Mr. F. Schubeler, which developed an extended discussion by representatives of the leading European manufacturers and engineers.

It was stated that engines of 2-cycle type developing 1000 brake horse-power per cylinder, are now under construction for marine service by a number of firms and that units of 500 brake horse-power per cylinder were in satisfactory service.

The European engineers have found it practical to use almost any mineral oil for fuel in these engines, even heavy tarry oils.

The calorific efficiency of these engines is about 30 to 40 per cent in the best practice, which means that with oil at 50 shillings per ton, power can be produced for about 0.11 d. to 0.13 d. per brake horse-power hour.

The weight of these large units is practically the same as that of a cast-framed triple-expansion steam engine of equal power, or a 1000 brake horse-power unit would weigh about 40 tons. The space occupied is the same as for the steam engine, so that the weight and space of boilers, condensers and other auxiliaries are available for other purposes.

It would seem that when this type of prime mover has proved its reliability and flexibility for marine service, it cannot help but be adopted. —*Engineer.*

MISCELLANEOUS.

ENGINEERING EDUCATION.—The Pittsburgh meeting of the Society for the Promotion of Engineering Education was held June 27, 28 and 29 at Carnegie Technical Schools and the University of Pittsburgh.

Engineering English.—The Tuesday morning session opened with two papers on English, a subject to which the society has properly devoted a great deal of attention. Prof. S. C. Earle, of Tufts College, described original plans which he has used in training engineering students in technical writing. He advocates special drill in English for these students, but he also regards general training in English as an integral part of a technical education. He does not, however, cling to traditional methods of instruction as do some instructors who, in Professor Earle's

words, "regard English as the last bit of salvage from the arts course remaining in the engineering school and as the only means of culture in a curriculum otherwise hopelessly practical." The art of clear expression involves clear thinking, especially if the description relates to other than visual images and symbols. Hence, if a student can be taught to write so as to impart accurate information he has been trained in thinking, which is, after all, the real function of a technical education. Following Professor Earle's paper, another of somewhat similar character was presented by Pro. F. N. Raymond, of the University of Kansas, on the preparation of written papers. He emphasized, as the essentials for success in technical writing, (1) accurate and thorough observation, (2) clear perception of other men's viewpoints, (3) correlation of ideas, and (4) good workmanship. By writing reports with these elements in mind an improvement will result whether the instruction is given by the department of English or formally by no department at all. In the discussion following these papers Prof. J. M. Telleen, of Case School, referred to logic as the basis of all work in English and every other subject. He defined rhetoric as "expression with the highest efficiency." Mr. William Kent believed that English can be taught best to engineering students in the engineering school and that engineering reports should be the basis of study of "engineering English."

Industrial Training.—Several speakers at the Tuesday and Thursday sessions emphasized the close connection which must exist between theoretical training and practical work. A recent interesting experiment at the University of Missouri was described by Profs. H. Wade Hibbard and H. S. Philbrick. They have attempted to teach the principles of scientific shop management by means of the engineering school shops. These shops have been organized as "management laboratories" and work has been put through them in accordance with the modern methods of "efficiency engineering." The experiment is so recent that only preliminary results could be reported, but apparently the students have entered into the spirit of the plan and are profiting by it. A paper based on a wide experience with technical graduates was presented by Mr. E. B. Raymond, vice-president of the Pittsburgh Plate Glass Company, under the title "The Technical Graduate from the Point of View of the Manufacturer." It was appreciated by the society because of the intimate knowledge of human nature which it exhibited. Mr. Raymond said that "it seems to me absurd to expect a college in four years to turn out men freed from their natural weaknesses when one considers the quality of the average human being who enters." Among these weaknesses he mentions laziness, disinclination for practical work, lack of seriousness and ability to assume responsibility, and lack of ability to become a part of a workingman's life. He believes that less "good time" and more "office atmosphere" would improve the college life. He gives as the requisites of success in engineering character, health, ambition and specific training.

Messrs. C. F. Scott and C. R. Dooley explained to the society a new plan for adapting technical graduates to the electrical business. The Westinghouse Electric & Manufacturing Company has modified the apprentice plan which has been used for some years by dividing the two years of its apprentice course into two periods. In the one period a more thorough but less extensive shop training will be given and this will be supplemented by classroom instruction. In the other period some one specialty will be taken up and mastered by each apprentice. The University of Pittsburgh is introducing a co-operative plan involving four twelve-week periods per year for four years. The first and last years will be spent in school, but during the second and third years the student will spend alternate periods of three months each in shop and in school. Dean F. L. Bishop hopes by this plan to meet the criticisms of the

technical graduate from the standpoint of employers in relation of their immediate adaptability to industrial conditions.

Teaching Mathematics.—An important feature of the Pittsburgh meeting was the reception of the report of the committee on the teaching of mathematics to engineering students. This committee was appointed four years ago by the American Mathematical Society and the American Association for the Advancement of Science and it was directed to report to both the American Mathematical Society and the Society for the Promotion of Engineering Education. The first purpose of the committee was to compile statistics regarding mathematical instruction in technical schools, but later the plan was changed to the present one. The report, as presented and, fortunately, accepted, comprises syllabi of the essential elementary mathematical subjects, algebra, trigonometry, geometry, analytical geometry and differential and integral calculus. The plan included a syllabus of "dynamics" or theoretical mechanics, but this was found impracticable for this year on account of lack of time to secure agreement as to the essentials of this subject. The report is an outline of the theorems which every engineering student should know well and which a professor should be justified in assuming as a reasonable mathematical preparation for his work. The committee believes that this is an adequate average preparation, but that if more advanced mathematics is needed in particular courses this should be taught in connection with those courses. Before accepting the report the society debated a number of details, such, for example, as the necessity for including vectors and complex quantities. These subjects were desired by the electrical engineering teachers and others. In accepting the report it was ordered published in the *Proceedings*, where it will be available for general use about January 1, 1912. The report appeared in full in recent numbers of the *Bulletin* of the society.

Prof. E. B. Paine, of the University of Illinois, gave an extended outline of the methods of electrical engineering instruction employed there. He showed that from a general treatment of the whole subject the instruction becomes more analytical as the work progresses. He lays great stress on mathematical theory, preferring, if necessary, to leave the more practical information to be acquired after graduation.—*Electrical World.*

THE TRAINING OF ENGINEERS.—The conference on the education and training of engineers convened by the Institution of Civil Engineers was held on the 28th and 29th of June, and was fairly well attended, there being present at the opening meeting, on a rough estimate, about one hundred and fifty persons. Whither it led we are unable to say. The views expressed were nearly as great as the number of speakers, and very exhaustive analysis will be needed if any definite result is to ensue. One thing, however, seemed to stand out fairly well, and that was that the engineering employer was beginning to kick against the excess of college learning, and to demand other qualifications than the mere ability to take degrees. The wiser professors fully endorsed the engineers' views in this respect, and we may possibly see some modification of the examination system, not only at the colleges and universities, but at the institution itself. Two other points also seemed to stand out prominently—one, that the young engineer, into whatever branch of the profession he proposes to turn, must go through a course of practical training, and the other that, taking one consideration with another, the best foundation for the engineering profession, as for all others, is a sound "literary" education such as is given by our best public schools. We do not know whether this is an indication that the pendulum is swinging back from the modern side, or whether the education given on that side is regarded as sufficiently literary in character, but the view obviously is that specialization at too early an age is undesirable.—*The Engineer.*

mathematics, that use which is collateral and intervenient, is no less worthy than that which is principal and intended."—*Army and Navy Gazette.*

CADET CRUISES.—One of the more interesting features of the Selborne-Fisher system of naval entry and training was the institution of blue water cruises for the naval cadets on leaving the Dartmouth College. The system had been inaugurated provisionally in October, 1902, by the appropriation of the *Isis* and *Aurora* for the purpose, the latter ship afterwards being relieved by the *Highflyer.* In these vessels, the pre-Osborne cadets, or the fourth term in the *Britannia,* made cruises, nothing of a similar kind having been carried out since the *Ariadne* was put out of commission in 1873. The *Isis* and her consorts took the place of the *Racer,* a little sloop which had been used to take the third and fourth term *Britannia* boys for short cruises in the Channel during the summer months. The *Racer* was bark-rigged, and made her passages under sail, using steam to enter and leave harbor. Beneficial as the cruises in the *Racer* were, they partook rather of the nature of pleasant holiday trips, and were very different to the sea voyages made in the *Isis* and *Aurora.* At first, these voyages were mainly confined to visiting ports on the British coast, but when the *Cornwall* and *Cumberland* relieved the *Isis* and *Highflyer* for the use of the Osborne cadets, the length of the cruise was extended. Now for the first time ample opportunity was afforded for the acquisition of valuable experience in modern vessels under ordinary routine, and much useful knowledge at the places visited abroad. It may safely be said that the cadets to whom these opportunities were given will always look back with pleasure to the enjoyable cruises made in the training vessels.

The cruises in the *Cornwall* and *Cumberland* take place at the end of the four years' college course, after the Dartmouth examination, and before that which forms the latter portion of the final test for the rating of midshipman. The new regulations required that each cadet should go to sea for six months, to be trained afloat in seamanship, navigation, pilotage, gunnery, and engineering by the specialist officers of the ship. There was, however, a good deal of elasticity allowed in the scheme of the cadets' instruction, and a good deal was left to the initiation of the captain of the vessel. In the first cruise of the *Cumberland* two cruises of three months each were made, with an interval between during which the lads went on leave. In the *Cornwall* one long cruise of six months was made, thus enabling the cadets to make a more extended voyage. Since those first two cruises the six months' voyage has been the rule, and only on two occasions have short cruises of three months been made, with an interval between for Christmas leave. It does not appear that the authorities have definitely decided which is the better plan, but naturally when the cruises are short no distant ports can be visited. For the purpose, the coast of Spain and the Mediterranean appears to be the favorite voyage, and such places as Arosa Bay, Gibraltar, Algiers, Golfe Juan, Naples, Malta, Syracuse, Castellamare, Leghorn and Alexandria have been visited. Next to the Mediterranean a cruise to the West Indies and Canada has been freuqently made, when such ports as Halifax, St. John's, Quebec and Bermuda have been visited. Naturally the weather and climate have a good deal to do with the selection of the places and locality visited, but the training ship has sometimes gone to ports in Norway, and once to the Baltic. The last-named cruise was made from May to November, 1909, in the *Cornwall,* and among other places to which she went were Copenhagen and Libau, while at Kiel on June 23 she was inspected by the German Emperor. It is of interest to recall the circumstance that Captain Trench and Lieutenant Brandon were messmates in the training ship on this occasion. It does not appear that the naval arsenals of foreign powers, except in this instance, have been visited, the names of Brest, Toulon, Spezia and Pola being absent from

THE PRACTICAL SIDE OF TECHNICAL EDUCATION.—In connection with the recent summer meeting of the Association of Technical Institutions, Mr. C. T. Willis read a paper on "The Training of Technical Teachers." What was needed, he said, was a happy combination of theoretical and practical knowledge, the former being kept in reasonable subjection to the latter in teaching. The most successful teachers he had known had been those who had received a fairly good education, had had wide practical experience of their trade, had kept in touch with trade literature, had attended trade classes themselves, and had also attended various classes in science subjects cognate to their trade. Mr. A. Nixon, principal Municipal Evening School of Commerce, Manchester, declared that in the commercial world the cry of "wake up" had done good service. Business men now realized that technical knowledge and ability were essential to the maintenance of our trade and prosperity. For the teaching of this knowledge we required trained teachers of types adapted to the peculiar form of teaching in evening schools. For technical work of a secondary or tertiary nature we must seek the assistance of the non-professional teacher, whose primary qualification must be approved industrial or commercial experience. Principal Walmsley (Southampton) said that for the technical teacher to know his work he must go into the workshop. Mr. R. Roberts, of the London Northern Polytechnic, speaking as an employer, declared that a close application of technical principles could kill technical education. Employers and workmen looked with grave suspicion at this academical side, for they found the men turned out of the technical institution were no good in the workshop. He believed that ultimately the trade of the country would be taught in technical institutions, but if they were to be successful they must not let them fall into the hands of the schoolmasters.—*Page's Weekly.*

THE STUDY OF MATHEMATICS.—The question of the education of boys destined for the army is just now so very much before the public that an article by Lieut.-Colonel C. F. Close, in the *Royal Engineers' Journal,* comes at an appropriate moment. The author, after disclaiming any intention of comparing the relative values of classics and mathematics as a means of mental training, shows that as regards the second of these subjects all that is likely to be required or useful in war is of a very elementary character, while in peace time the chief opportunities for its employment occur in the domains of gunnery construction, engineering, electricity, etc., all important studies, but ones that are not necessarily confined to soldiers. When, however, Colonel Close comes to deal with the second part of his investigation, the conclusions he arrives at are far more interesting. The important question that he puts is: "What is the indirect value to a soldier of an aptitude for mathematics, and what is the indirect effect of a mathematical training on his habits of thought?" To find his answer he examines the education and special aptitudes of the great commanders born in the eighteenth and nineteenth centuries, those chosen being Frederick, Washington, Napoleon, Wellington, Moltke, Lee, and Jackson. From an exhaustive study of the lives of these men, Colonel Close finds that one conclusion stands out clearly—namely, that not one of these commanders had the slightest inclination or aptitude for classical studies, and further that the most impressive positive fact is that Washington, Napoleon, Moltke, Lee and Jackson, and to a small degree Wellington, were all men who evinced to a greater or less extent an aptitude for mathematical studies and calculations. No one with experience of men of action will be surprised at this result of Colonel Close's investigation, and we would wish that its lessons were likely to be more widely appreciated by the modern schoolmaster than is, we fear, the case. In this connection Bacon is worth quoting. He says, "As tennis is a game of no use in itself, but of great use in respect it maketh a quick eye, and a body ready to put itself into all postures; so in the

the itineraries. Nor do the training ships seem to have gone to any naval port in the United States. Possibly there is good reason for these omissions, otherwise visits to foreign naval ports would appear to be among the more interesting and useful experiences which could be given to the cadets.

It must be remembered that these cruises are preliminary to appointments to the ships in the fleets and squadrons on active service. They form part of the instruction given before the final qualifying examination for midshipman, and during the cruise the lads are not only practically taught seamanship, engineering, and navigation, but undergo drills and exercises, and to a large extent conform to the ordinary routine of the ship. It is most encouraging to learn both from the reports of the officers engaged in imparting instruction, and from Sir Alfred Ewing, the director of Naval Education, that the system has given even better results than were anticipated. Of course, the system of training ships for cadets is not confined to the British service. We are familiar with the presence of German training ships in our ports, and the little *Fylgia*, the Swedish training ship, is often in our waters and was present at the Coronation Review. Recently also, the American Naval Academy Practice Squadron has been at Queenstown and also visited the Baltic. It is interesting to compare the difference between the American method and our own. The batch of British cadets sent in one cruiser seldom exceeds fifty, but no less than 500 cadets are said to have come over in the three battleships which form the Naval Academy Practice Squadron. Moreover, the greater part of the officers on duty at the academy appear to be drafted to the ships for the cruise, so that the studies in the institution must be practically at a standstill. Whatever may be the system chosen, there can be no doubt about the value of the cruises in these schoolships, when the youngsters obtain an early acquaintance with the practical work in a man-of-war.—*Army and Navy Gazette.*

THE USE AND ABUSE OF INSPECTION.—It has been remarked that society in these days is rapidly becoming divided into two classes—the inspectors and the inspected. Engineers especially realize that there is a great amount of truth in this saying, as few orders are placed nowadays for engineering plant or materials which do not stipulate for inspection. This tends to become stricter every year, owing to various reasons, the chief being that manufacturers in selling their goods are now generally bound down both in price and time of delivery, the former being so low and the latter so short that mistakes are more liable to occur than was the case in the old days, when the manufacturer could ask and obtain his own price and could take his own time. In those days the buyer often had to take what the manufacturer gave him, and was glad to get it at almost any price. But now the buyer knows quite well in most cases what he wants, what price he ought to give, and exactly what he ought to get for that price, and his main object is to see that he gets it. It follows, therefore, that buyers have come to the conclusion that their interests will be best served by employing inspectors empowered to visit the works of the contractors at all reasonable times, without notice, and to follow the course of the order through the works, testing the materials and the finished work, and checking quantities, weights, etc.

There is, of course, no attempt on the part of firms of good standing deliberately to defraud their customers. But at the same time manufacturers cannot afford to do more than keep to the bare specification, and specifications are often interpreted differently by buyers and sellers. Then, again, the heads of a firm cannot always attend to every detail, and foremen and workmen will often scamp work, either because they are on piecework, or merely to save themselves trouble. In the matter of loose rivets in steelwork, blowholes in cast-iron pipes, and such-like small but important defects, the inspector cannot lay the blame on the manager or foreman unless the flaws are numerous. But it is his business to find

these flaws out, and if he discovers a number and sees them put right in the early stages of an order, he will find that the workmen will take more care afterwards. Again, mistakes are frequently made in dimensions, and many firms have no system of checking their finished products, even when the matter is left in their hands.

A good inspector, dealing with large quantities of materials, will save his employers many times his salary in the course of a year. But, to gain the full benefits of inspection, a good man must be engaged. An inspector cannot be an expert in everything, but he must have a very clear idea of the difference between good and bad work, and must be able to read drawings easily. Then an inspector must be firm and able to hold his own, but at the same time tactful, and his honesty must be above suspicion.

An inspector with the above qualifications, and who is also the equal socially of the managers of the works he visits, can do a great deal for the firm which employs him. At the commencement of a contract he goes through the specification and drawings and clears up any doubtful points, both with his own firm and the contractors. He also informs the contractor what kind of work he expects to get and what processes are to be employed on the various details; for instance, it is often left to the inspector to say whether holes are to be drilled or punched; whether plates are to be sheared or planed, rods and bolts solid or welded, etc. When the work commences the inspector will test the materials and see that no unavoidable delay takes place at the rolling mills, and will then follow the work through the contractor's shops and see that the various processes are carried out as specified, or as he wishes, and that the finished work comes together correctly, is of the proper dimensions, and, if necessary, is properly marked for re-erection.

If he is a tactful man and knows his business, he can get the contractor's manager and foremen to agree to his suggestions and requirements with very little trouble, and to push his work on as quickly as possible, and in the case of any alteration he acts as a buffer between the buyers and the contractors.

There are, however, a number of independent inspecting engineers who will offer to take inspection work at extremely low and insufficient rates. They can only do this by employing very young and badly paid men to do this work for them, or else by giving half the time to it that they should do. It may be taken as an axiom that in the majority of cases cheap inspection is worse than no inspection at all, as it relieves the contractor from liability without giving the buyer a sufficient guarantee that the work is properly carried out. There is, of course, certain work which can be attended to by an inexperienced inspector just as well as by an experienced one, but, as a general rule, when work which has been cheaply inspected turns out satisfactorily, it would have been just as satisfactory if it had not been inspected at all.

This brings us to the question of the abuse of inspection, about which manufacturers have a great deal to say, although it affects the buyers more than they are perhaps aware. An inspector may be very conscientious, but either through want of tact or experience, or both, he may be the cause of endless trouble between buyer and seller. Such a man walks into a works as though it belonged to him, calls the manager and foremen over the coals for the slightest cause, treats them openly as though he believes they are deliberately trying to cheat him, persists in sticking to the exact letter of the specification, and rejects quantities of material for little faults which do not matter in the least. The result of all this is that he is disliked wherever he goes, his work is delayed, and people who would not do it otherwise try to get the better of him in order to get him into trouble. Besides this, contractors who have had experience of an inspector of this kind make allowance for him in their next quotation and ask higher prices.

Unnecessarily strict and minute inspection is not, however, always due to the inspector, as his employers may tie him down to the specification, and practically refuse to allow him to use his judgment at all. Certain consulting engineers are very strict in this way, and are so well known that extra prices are always charged to cover their inspection.

Another abuse of the inspection system is to send an inspector to see very small quantities of material; we have known many cases in which inspectors have travelled long distances to inspect, perhaps, 1 cwt. of ordinary quality steel, the cost of the inspection coming to two, three, or four times the cost of the material. The government departments are probably the worst offenders in this way, the total cost of some of their small orders being out of all proportion to the value of the material or the use to which it is to be put. Considerable delay is often caused, also, by having these small orders inspected, as the inspector may have to wait days before he can visit the works, owing to pressure of more important work, and favorable opportunities of forwarding the material along with other goods are thus missed. Moreover, if the material has to be tested, the inspector may have to pay two visits to the mills, one to select and stamp the test-pieces and another to see them broken, as the mills cannot always prepare the test-bars the same day.

To sum up the whole question: inspection is useful and worth while under certain conditions, but not under all conditions. It pays well to inspect, provided the inspector is a firm and tactful man with a good general knowledge of engineering and inspection, and with an honest and honorable character, and provided also that he has plenty of work on big orders and is given a fairly free hand and allowed to use his judgment in the interpretation of a specification. In other words, the inspector must be a good one and must have plenty to do, and the more costly the work that he inspects the more worth while the inspection.

Inspection, as a general rule, does not pay when the reverse of these conditions is the case: when the inspector is tactless, of weak character, without workshop experience, or badly paid. It does not pay to be very strict on small variations from the drawing or specification which do not affect the quality of the work, nor to send an inspector to pass every small order, unless for special material. It is also a question whether it pays to inspect cheap materials, such as bricks, tiles, earthenware pipes, paving, etc. These things are bought in large quantities, and the inspector usually sees them stacked in the maker's yard.

The more works a man visits, and the greater variety of materials he inspects, the quicker he will be to detect bad work, to suggest improvements, and to get orders through satisfactorily.—*Engineering.*

THE NAVAL ARCHITECTS.—All last week was devoted to the jubilee celebrations of the Institution of Naval Architects. There were receptions, a banquet, a concert, luncheons, river trips, garden parties, etc., galore, and there was just sufficient work to bring together those who were seriously minded for a few hours a day to consider professional questions. The long program was traversed without a hitch of any kind, and the excellence of the arrangements throughout won for Mr. Dana and his staff, on whom the bulk of the work fell, the heartiest praise in all quarters. It was such a jubilee as no other institution has had. It was honored by the presence, on the opening day, of the Duke of Connaught, and, if we may say so, still more by the presence of men from all corners of the globe who have won illustrious names in shipbuilding, in the management of ships in war and peace, and in general engineering and science. The papers, too, which were presented were not of the ordinary nature, but were specially devised to suit the occasion. Sir William White fittingly opened with an address which gave the history of the Institution during the fifty years of its life, and he was followed by authors who dealt with progress in special directions during the same

period. Admiral Sir Cyprian Bridge discussed the influence of naval architecture upon tactics, and of tactics upon naval architecture; Sir Andrew Noble—one of the most honored figures at the Congress—outlined the progress of naval artillery since 1860; whilst Mr. Charles Ellis sketched the rise and improvement of armor in the same period. With the changes of design in warships Sir Philip Watts dealt in an exhaustive paper which, although it was deemed too long to read at the meetings, will remain always an invaluable source of information on the history of the steam and steel navies of the world; and Sir Henry Oram outlined the changes of the last fifty years in British warship machinery. With mercantile ships, which have as much call upon the attention of the Institution as warships, Mr. Thearle dealt, and certain aspects of naval architecture in foreign countries were described by representatives of those countries. Taken as a whole, the papers form a remarkable series, dealing very largely with a history peculiarly fascinating to Englishmen. In one respect that history is not being carried on by the Institution of Naval Architects. For many years the representatives of the Admiralty discussed openly at the spring meetings in the Adelphi the design and construction, the trials and successes of British warships. That is no longer done. Our warships are now built in secret; the tongues of our naval constructors are tied, and the advantages which their predecessors enjoyed by free discussion are denied them. What is gained by this determined official secrecy we are unable to tell. No one pretends that other nations who make it their business to find out remain in the dark as to what we are doing, and they can always have the latest expression of Admiralty ideas by asking for tenders from Admiralty contractors, for it is impossible to conceive of any ship being designed which does not borrow something from all those that have preceded it. The point was alluded to by more than one speaker at the congress, and we trust the time may come when the unwisdom of such secrecy as is now enforced will be appreciated, more liberty will be left to Admiralty engineers and contractors, and we shall see again those pages in the proceedings of the Institution of Naval Architects, the most fascinating they held, where the history of each step in the progress of warship building may be read. —*The Engineer.*

Sir William White said it had been the practice, and he believed was still the practice, of the Japanese authorities, when a contract was made for building ships or machinery in this country, or in any other country outside Japan, to associate with that a condition that there shall be received into the works where the ships were being built, or the engines constructed, young Japanese constructors and engineers who should be afforded opportunities of studying and of becoming acquainted with European methods, or, in later years, with the methods of the United States. That practice dated back for only sixteen years. He did not know whether it had been appreciated, that it was since 1894 that the mercantile fleet of Japan had been created, so that it might well happen that things had not yet got into balance in the way of production of materials and ships as to the question of cost. He would not wonder at all if Japan became a serious competitor with European countries in the production of shipping of all classes. He noticed that Dr. Terano stated that the intention was that the Encouragement Act should have fallen out of use in 1911, but that it had been prolonged for a further period of ten years. The history of subsidies suggested that when once given they were a little difficult to part with, and he was quite sure that the Japanese shipbuilders would prefer to have them continued. Japan had given a marvellous illustration of what systematic action and State encouragement, properly directed, could effect in the training of workmen and of naval architects and marine engineers.

Lord Charles Beresford, who opened the debate, dealt with the *personnel* of the modern British warship, which, in his opinion, whatever the quality of the equipment provided, was the most important factor of all. He regretted, as was pointed out by Sir Henry Oram, that the year 1910 witnessed the introduction of a new system, and that we had seen the last of the old arrangement under which engineer officers passed into His Majesty's service. In his opinion nothing could have been better than the working of the engineers' department under the old method. He would like, however, to ask if Sir Henry Oram were satisfied with the present proportion of officers to men. It would seem from the figures given in the paper that while with the increase in the requirements of the service the number of men had considerably augmented, the number of officers remained about the same. He would point out that the responsibility resting on the officers had greatly increased, and the figures showed that in the Japanese Navy the proportion of officers to men was higher than in our own navy.

Admiral H. I. Cone, U. S. N., questioned whether the combined system of reciprocating engines and turbines, or geared turbines, or, indeed, any of the proposed methods for improving the efficiency of the turbine at low speeds were worth the extra complication involved.

Mr. Borowicka (Austria) said that those responsible for the designs for the Austrian Navy had not looked with favor upon the combination system, but that attitude was partially explained by the fact that Austrian ships of war did not have to make the long voyages to which the English fleet was accustomed. For their special requirements they found that the fitting of cruising turbines for low speeds was sufficient.

Mr. W. M. McFarland said that the trials of the collier *Neptune*, which had been fitted with geared turbines, were now being carried out. Information as to the results of those trials in United States waters was not yet available, but he was able to say that on a preliminary trial extending over forty hours, at 7000 horse-power, with these turbines, the efficiency figure obtained was 98 per cent.

Mr. A. E. Seaton agreed with what had been said on the subject of British war vessels being in some respects undermanned. The present complement might be sufficient for times of peace and cruising conditions, but was not capable, he believed, of working the ship in war.

Professor A. Rateau commented on the rapid development of the employment of the Parsons turbine. The curve of horse-power built as shown in Sir Charles Parsons' paper was rising at a very rapid rate. This satisfactory result was due not only to the invention itself, but also to the persistency of the inventor. He would like to point out that the installation in the *Velox* was different from that in the boat fitted by Messrs. Yarrow, or that in the destroyer *Chasseur*. In the one case the engine was coupled direct to the shaft, while in the other separate shafts were employed. He noted that Sir Charles had classified the Rateau turbine in Class 4 in his paper, but it appeared to him that it would have been more properly placed in Class 3. It was really of the combination type, and in its application to marine work had always been in that class.

Sir Charles Parsons said that the combination system opened up many possibilities, but it had its limitations, and the lack of elasticity prevented its application to certain classes of warships. There could be no doubt he thought as to the advantages of gearing from many points of view, and particularly for the realization of high efficiency under all conditions. There was no extra space required for the geared turbine, and it presented no disadvantages on the score of cost. He was not in favor of the floating cradle (Westinghouse type); it was sufficient if provision were made to allow end movement of the pinion shaft.

Sir Henry Oram, in a brief reply on the point raised by Lord Charles Beresford, expressed the opinion that the number of officers and crew provided for the *Neptune* was quite sufficient. It should not be over-

looked in making comparison with the old system that the artificers, of whom a large number were carried in the modern ships, could be regarded to some extent as being the equal of the old type of engineering officer.

Mr. A. E. Seaton mentioned that thirty-nine years ago he had some Japanese pupils, and he never had a greater pleasure from a professional point of view than in teaching them. Subsequently he had had the pleasure of designing the engines for the first modern Japanese warship, the *Maya,* and also for the sister ship. In those days, although the Japanese were only just beginning to get used to Western habits, they were clever enough to have something better than the British Navy had for the same class. This was the class *Gem,* which had very big cylinders on not very big boilers, and with very hard stoking 12½ knots could be got out of them, whereas the boilers in the Japanese ships gave 14 knots fairly comfortably. The sting of the paper was in the tail, and it required a little explanation. The author said, in the paragraph headed "The effect of War upon Machinery," that some of the Japanese ships in the late war were under steam for 2000 hours continuously, and no noticeable trouble was given. That was because the Japanese were not persuaded into buying cheap things. It was no use offering the Japanese Government anything in lieu of something it had set its mind on because it happened to be a little cheaper. The Japanese Government always purchased the very best articles in the market. The gallant admiral had not said very much about the Japanese mercantile marine, but he had seen illustrations of some exceedingly fine passenger steamers which were equal to anything that we could turn out in this country, judging by the figures. There were also coasting steamers which seemed as near perfection as was possible at present. One advantage which the Japanese had in this matter was that they were not hampered by traditions. They were in the position of being able to approach the subject afresh, and consider everything from an engineering point of view only. If we could only sometimes forget a little history it would be a great deal better for everybody, and a great deal better for the British Navy.

Admiral H. I. Cone (United States Navy) said there were some specimens of Japanese merchantment trading with the West Coast of America which were most modern in every respect, being fitted with oil fuel arrangements, etc., and, much to the disgust of the American and British shipping companies, they were taking all the traffic.—*The Engineer.*

AEROPLANES IN NAVAL WARFARE. *Reconnoitering—Use in Coastwise Signaling.*—It is evident that reconnoitering will be the main sphere of action for aeroplanes. Just like the dirigible it will be possible in certain cases for the aeroplane to supplement the signal and information service on land with more or less reliability.

If we take as efficiency a time of flight of four hours and a speed of 80 km. per hour, it is possible for an aviator sent out from the coast observation station to reconnoiter large regions of the Baltic Sea. France has also tried successfully to equip the aeroplanes with wireless telegraph outfits. But this can mean instruments for short distances only; and in the future, we will probably not be able to count on any far-reaching wireless equipment on account of the weight. The resulting information will therefore be known only after the return of the aeroplane, as is not the case with airships. When we consider the great speed with which the aeroplane travels, such reports will still be very valuable. As a distinct advantage of the aeroplane we must consider the fact that it can approach the enemy within a comparatively slight distance in order to take observations, since the aeroplane offers a very small target, so that it need not fear hostile shells.

As regards spotting of submarines and mines, the same holds true here as with the airship, with the addition that an accurate determination of

locality is even more difficult for the aviator in the aeroplane than in the airship.

Use for Reconnoitering in Connection With a Fleet.—On the other hand the work of reconnoitering in the service of the navy is reserved to the aeroplane. An example will illustrate the importance of such a service. An enemy blockading the mouth of the Elbe River wishes to know where German ships are anchored, in order to move light bodies of troops at night. An aeroplane sent out just before darkness will give good service. Again, the reconnoitering ships of both sides meet in battle. Authoritative information seems out of question, although information as to the strength of the hostile force is essential. Again an aeroplane will be useful. So far the transmission of orders and reports, the aeroplane can be employed with great usefulness, from shipboard to land and from one slip to another, as for example, in connection with separate squadrons of a fleet; and finally for communication between land and shipboard.

In this use we have the further question of possibility of flight and landing on board ship. With a good road and start into the wind the aeroplane can rise with an initial start of 30 to 40 meters on an inclined plane, perhaps even faster. At any rate it will be possible to find a deck of sufficient length on large ships, which can be equipped for a satisfactory start. At the end of 1910 an aeroplane rose from the rear promenade deck of the German Hamburg-American Line steamer *Kaiserin Auguste Viktoria* near Sandy Hook and carried dispatches and mail to land. In New York harbor similar starts from Hamburg-American Line ships were tried with success. It would be more difficult to find room for such a starting platform on warships where the disposition of the guns is of first consideration. It would be possible, perhaps, to use starting devices similar to those used originally by Wright machines; probably on board with sufficient height for the starting flight a shorter distance will be sufficient than is customary on land since the aeroplane, as soon as its wheels have left the deck, begins a gliding flight, which the influence of the propeller with increasing horizontal speed will change into the normal soaring flight.

The possibility of such a start from a warship was illustrated by the successful trial of the American aviator Ely, who toward the end of 1910 flew to land from the American protected cruiser *Birmingham.* More difficult than this problem will be alighting on such a limited space as is available on board ship. But this problem also was solved in January, 1911, by Ely, although such special arrangements had to be made on the American cruiser *Pennsylvania,* as would be impossible in actual warfare; on the rear deck was an inclined wooden track of 40 meters length and 18 meters wide and a receiving device for the aeroplane. But this could be avoided by having the aeroplane descend on the water and then raise it up on board as one would raise a boat. For this purpose either the frame or the planes must be made to float or special floating runners must be used, which, however, would have the disadvantage of causing a special air resistance. Whatever it may be, aeronautics has already surpassed greater obstacles than these. It is very likely that a competent solution will soon be found. For only with this point in view is it possible for the French to have made steps to introduce aeroplanes in the navy, and they intend to equip land stations and special ships in this way. An old cruiser *Foudre* is being rebuilt for this purpose. It is no wonder that they made the start, in view of the advance standing which they enjoy in the realm of flying. The Americans will probably follow in the near future, for several years ago, the War Department announced a high prize for an aeroplane which can start from shipboard and can alight on the water. A Curtiss aeroplane has fulfilled the most essential requirements in January, 1911, in San Francisco, by rising from the water and alighting on the water. This aeroplane had cigar-shaped floating

runners. All this shows with what zeal America tries to make the aeroplane useful for naval warfare. Since the German budget has also means for tests with aeroplanes, it is to be hoped that this will be a further spur for all interested parties, to bridge over the gap, which separates Germany in this line from the other two nations.

Other Possible Uses.—As a last point we must view offensive possibilities of aeroplanes. We should consider that an aeroplane to be used above the sea, should have a great safety factor of operation and great duration of service, so that it may again reach its home destination in safety. Great safety for operation requires great weight, endurance in operation demands a large supply of benzine and gasoline. Moreover, a second person should ride along as observer and for the navigation, compass and navigating instruments will be necessary. There is little space left for conveying any means of attack, save with a few light hand grenades, or similar explosive projectiles, which at times may be effective against torpedo-boats, submarines or dirigible balloons. But on the whole the aeroplanes will always lack any noticeable offensive power for naval warfare. In addition to this we have the difficulty in hitting a target when throwing missiles during the rapid flight.

The aeroplanes are and will be useful mostly for reconnoitering.

We do not intend to assert that aeroplanes are at the present time adapted to all the uses mentioned, but that the present state of development gives hopes that these will be reached within a short time. Then it will be time to test them in practice.—Extracted from an article by "A German Naval Officer" in the *Scientific American.*

NAVAL AVIATION. By Capt. W. Irving Chambers, U. S. N.—A short time ago, when flights were made in perfect weather only, the navy regarded aviation with complacency. Now that the greater possibilities of flight under average weather conditions have been demonstrated, a majority of our officers are eager to have a hand in the development of aviation for naval purposes, and the fascination of aerial navigation now appeals so forcibly to the spirit of daring in our young officers and men, that our chief difficulty in the future may possibly be so to temper their enthusiasm for flying as to insure the performance of other more necessary and more important duties with the usual degree of efficiency.

I have not the least doubt that these fine young fellows would soon be capturing altitude and other records if allowed to do so, and that to advocate conservatism in aviation now, in the face of its present popularity, will seem almost heretical to them.

But a certain amount of conservatism, at least in the naval branch of aviation, is imperative, and, as aeroplanes are quickly made, it seems to be sound policy for the navy to make haste yet a little slowly until the machines are better adapted to our special needs or, at least, until we have a sufficient number of aviators trained to use them and to measure their efficiency under service conditions.

A conservative policy is evidently that of foreign navies also; but it is known that France has already two naval aviators and one naval aeroplane, that the English Navy has two naval officers under instruction through the courtesy of the Aero Club of Great Britain, and that Italy, inspired by some aeroplane experiments recently made here in conjunction with our ships, is about to develop a suitable machine of the class that we have already evolved in this country.

In fact, although the United States Navy does not as yet actually own an aeroplane, our small beginnings in the development of naval aviation, or the practical efforts that we have made within the last six months have attracted the attention of other naval powers, and we will doubtless soon learn of great advances in the improvement of aeroplanes for naval use generally.

It was only last summer that demonstrations of air flight in this country made it seem probable that aeroplanes could be used from a ship. At that time the principal factor in the general development of aviation seemed to be the stimulus afforded to aviators by substantial money rewards for exhibition flights, and Mr. Eugene Ely deserves special credit for cheerfully and enthusiastically entering into the spirit of naval aviation without the prospect of any reward whatever.

Mr. Ely may be regarded as a pioneer in this branch, although it should be recorded that he might not have been able to attempt his brilliant work under the auspices of any other than the liberal, yet safe, management of Mr. Glenn Curtiss.

It was fortunate for us that one school of aviators was ready and eager to co-operate with the navy; for this connection with the Curtiss school led to a series of progressive experiments that have resulted in the production of a naval aeroplane that is almost perfect.

With this machine Mr. Curtiss is able to arise from or alight on either land or water. He can land on water that is comparatively rough. His "Triad" can be hoisted in and out like a ship's boat and, in accordance with plans already perfected by Mr. Curtiss, we will probably soon be able to launch this machine from shipboard without the necessity for any special platform or the provision of any extra gear that may not be rigged or unrigged in a few minutes.

In my opinion, Mr. Curtiss has recently done more for the development of naval aviation than any other man in the world and he deserves special honor for his liberality and foresight.

The usual policy of aeroplane builders is to make the training of military aviators contingent upon the sale of their machines but Mr. Curtiss early adopted the policy of offering to instruct officers of the army and navy in aviation unconditionally, and it is due to this liberality that the navy is ready, now, to train its own aviators, although the money appropriated for independent work in aviation will not be available until the first of July.

The Wright brothers, of whose work the country is justly proud, have also offered to train a naval aviator, and we anticipate the early inauguration of a systematic course of instruction in aviation, entirely under the auspices of the navy, at our own aerodromes, which for obvious reasons it is desirable to have so located as to be accessible to naval vessels.

I regard the development of the naval aeroplanes, or hydro-aeroplanes (the Curtiss type of which has been named the "Triad" from its triple power to function on any of the three elements, air, land or water) as marking an important epoch in aerial navigation.

If ever trans-oceanic flight by aeroplanes is accomplished, I presume it will be due to the further development of this class of machine. By its use aerial navigation becomes a matter of comparative safety and a means of delightful pleasure trips and sporting events over water.

There is now and always will be sufficient talent in the navy to build its own aeroplanes as well as to operate them and to keep them in the van of progressive aerial architecture. But it is a well-known policy of the Department to encourage private industries in the development of war material and, as this policy will doubtless prevail for some time with respect to aeroplanes, I see no good reason for the navy to attempt now to build its own aerial machines. It is hoped, however, that this policy will not prevent the navy from making its own laboratory experiments, conducting its own scientific investigation of the problems of aerial naval architecture and engineering and establishing a sound system of standard tests for workmanship. It is also hoped that this policy will not prevent the navy from eventually embodying, in its standard machines, the best points of all makes that are specially suited for naval purposes.

From my point of view, the principal problem in future flight is the improvement of the motive power. It is the most important because most difficult. Of course, there will be great improvements in the details of shapes and materials and in the assemblage of various other accessories, but we would have been flying fifteen years ago if we could have commanded then the same degrees of efficiency and reliability of the motive power that are at our command to-day. It seems to me, therefore, that there should be some recognized and authoritative government testing or comparing station for motors and propellers in order to make effective progress in their development. Suitable facilities for this work already exist in the navy. The motors and propellers for future naval aeroplanes will doubtless be thoroughly tested and compared, both in the shop and during flight, at the Engineering Experiment Station at Annapolis and at the aerodrome in that vicinity. In this way the navy may be able to assist in the desired general development.

As for laboratory work connected with the test of models and the materials that enter into the architecture of aeroplanes, the government model plant at the Navy Yard, Washington, is already well equipped for prosecuting scientific investigation in this direction. There we have suitable delicate recording instruments, a corps of expert woodworkers or model makers and draftsmen under the direction of mathematical experts, and all under the disciplined organization of the Navy Department, ready to undertake the work almost immediately.

I anticipate that, by the introduction of aviation in the navy, we will be able to develop substantial improvements in certain necessary instruments such as the aeroplane compass, for example, and that we will be able to add something of value to the science of meteorology. Those of us who were brought up in sailing ships realize that our dependence on the wind and weather sharpened our weather instincts. Aerial navigation will doubtless develop in our future naval airmen a yet keener appreciation of weather indications, through their greater dependence on them, and the meteorological observations of these men will doubtless be recorded systematically.—*Scientific American.*

BOOK NOTICES.

"Marine Engine Design." By Edward M. Bragg, S. B., Assistant Professor of Marine Engineering, University of Michigan. (Published by D. Van Nostrand & Co., New York. Price, $2.00.)

Most text books on marine engines deal only in a general way with the subject of design: no matter how extensive the work, nearly all the space is taken up with descriptions and illustrations of various types. On the other hand those on "Machine Design" cover a broader scope than is intended in this one.

A text-book on machine design should treat of the application of the principles of mechanics to the design of parts, it is a study of the application of scientific principles to all branches of engineering practice. But in many cases the forces acting are necessarily unknown, and appeal must be made to the precedent of successful practice or to the judgment of an experienced man. The multiplicity and complexity of the problems which arise are such that a complete treatise on this subject is too general for those who deal with marine engines only. This book takes up the subject of marine engine design and should prove more readily available for the use intended than any other now on the market.

A marine engineer, even though he is not taking up the subject of designing as a specialty, will be more efficient as an operator if he understands the principles of design.

In general there are two considerations of prime importance in designing engines: I. Adaptation. II. Strength and stiffness.

I. Adaptation requires that each part accomplish the desired result in the most direct way, and with the greatest convenience to the operator. The book gives up-to-date practice in this, the following extract will illustrate, page 43, under "cylinder covers." "The studs should be placed far enough apart to allow a wrench to be used freely, and near enough together to make the joint steam tight. For the sake of convenience and simplicity, it is usual to calculate the studs which should be used for the high pressure cover, and then to use the same size of stud upon other cylinder covers increasing the spacing as the steam pressure decreases."

Usually the size of the engine rooms is fixed and the engines have to be designed and the necessary auxiliaries selected and located. This is where the problem of adaptation comes in, more than in the design of the engine proper. There are certain general principles to be followed in the location of valves and auxiliaries and in the lead of pipes, etc., that are often neglected by ship builders. This seems to be beyond the scope of this book.

II. Strength and stiffness. In his ideas the author has followed up-to-date practice. He bases his calculations on the laws of mechanics and the known qualities of constructive materials wherever possible. In certain cases standard proportions or empirical rules are used. A knowledge of pure and applied mathematics is presupposed. The scientific formulæ are easily deduced from mechanical principles but some times they are taken without any reference as to how they were obtained, making it difficult to see the author's course of reasoning.

In other cases, in both empirical and scientific formulæ, the units of some of the factors are not stated. It is most important, particularly for students, to make it clear why any given formula is used either by indicating how it is deduced or, if the formula be empirical, why it was selected for the particular case at hand.

The design of turning and reversing engines are taken up in the same general way, formulæ and computations for specific cases are presented in a similar manner as those for the design of the main engine.

To sum up:

1. The book should prove readily available for the use for which it is intended.

2. The practice given is modern and up to date.

3. The descriptions are clear.

4. The book would be improved if the reasons for use of each formula were more clearly set forth, it would reduce the tendency of the student to use the formula blindly, and if the scope were increased to include the general arrangement of machinery in the space allotted.

W. B. WELLS.

"Marine Gas Engines, Their Construction and Management." By Carl H. Clark, S. B. Price $1.50 net; D. Van Nostrand Company.

CONTENTS.—*Types of Engines:* Principles of operation of each type. Advantages of each type.—*Two Cycle Engines:* General Construction. Description of some standard types. Pumps.—*Four Cycle Engines:* General Construction. Description of standard types.—*Vaporizers and Carbureters:* Vaporization of fuel. Principles of Operation and description of standard types.—*Ignition Devices:* Principles of ignition. Mechanisms of igniters. Times. Spark coils. Plugs. Batteries. Dynamos and magnetos.—*Ignition Wiring:* Diagrams for Wiring. Spark coils. Distributor.—*Lubrication:* Methods of lubricating the several parts.—*Multiple-cylinder Engines:* Description and construction of standard types.—*Reversing Mechanisms:* Reversing propeller. Reversing gears. Reversing engines.—*Propellers:* Definitions. Efficiency. Measuring Propellers. Calculations.—*Installation:* Foundation. Piping. General considerations and description.—*Operation and Care of Engines:* General Instructions. Hints on finding troubles. Care of engine and outfit.—*Power of Engines:* Horse-power. Formulas for power. Method of finding power. Brakes.—*Selecting an Engines:* General considerations to to type, size and construction.

As seen from the table of contents above given, this book does not go into the theory of gas engines at all but is intended only for those who may want to learn enough about them to intelligently select one for a certain purpose and then to run it.

The book is systematic and logical in its arrangement, the principles are first explained followed by descriptions of standard types and their accessories. It is broad enough in its scope for the purpose intended. There are 102 well selected sketches, each of which shows only the detail intended, thus avoiding the confusion usual where one complicated sketch is made to show several details. The descriptions are given in a plain and simple form.

The chapters on "Lubrication" and "Operation and care of engines" are complete and to the point. That part on "engine troubles" should prove particularly valuable to the amateur gas engine operator.

The book contains 115 pages 7½" x 5½" and will be found well adapted to those desiring a brief systematic presentation of the principles and methods of operation and the details of construction of modern gas engines. W. B. Wells.

"A Short History of the United States Navy." By Captain George R. Clark, U. S. N., Professor William O. Stevens, Ph. D., Instructor Carroll S. Alden, Ph. D., Instructor Herman F. Krafft, LL. B., of the Department of English, United States Naval Academy. (Philadelphia and London, J. B. Lippincott Company, 1911. Pp. 505.)

The authors inform us in their preface that this history of the American navy owes its origin to the "need of a work suitable in scope and treatment as a text-book for the midshipmen of the United States Naval Academy." They add: "Since, in a tentative form, it has been used by them with gratifying results, there is hope that it may prove of interest and value to others whose time for this subject is limited." The book is unreservedly recommended to all teachers of American history in high schools and colleges, and especially to those who have had difficulty in selecting from the large mass of naval facts the information possessing the greatest educational and probative value.

The authors further inform us that the book has been written with certain definite aims, the principal of which are the following:

"First, to present a record of exactly what happened, without personal, sectional, or national prejudice. Second, to regard naval events from the professional rather than the picturesque point of view; for example to emphasize the maneuvering and gunnery in an action rather than the smoke and blood. Third, to suppress the trivial and bring out the important, not neglecting the services of officers in time of peace. Fourth, to give, whenever possible, the original sources, such as letters from secretaries of the navy and official reports of officers." These are all worthy aims, whether for a text-book or a general naval history, and the authors have succeeded in realizing them.

It is especially noteworthy that this book treats of the navy in peace as well as war. To many students it is not clear that the history of the

navy in the one period is comparable to that in the other. Indeed the popular view seems to be that the navy has no history during peace. It is not too much to say that the peaceful history of the navy since 1865 is as important from many points of view as its warlike history during the American Revolution. The reviewer is pleased to note that this volume contains such subheads as "the marine committee," "types of ships and guns," "the founding of the naval academy," "Perry's expedition to Japan," "the period of naval decay," "the birth of the new navy," "the navy in Polar exploration," "diplomatic services of naval officers," "cruise of the battle fleet," and "recent development in ships, guns and personnel." There are a few other subjects, such as the development of the navy department and the administrative services of naval officers, which, if space admitted, might have been included in this class.

In treating of our naval wars, the authors have rightly laid considerable stress on the civil history of the navy, although naturally and properly most space is devoted to naval actions. In respect to the latter it is enough to say that their selection is excellent and that their treatment corresponds with the aims that they have set for themselves and that have been enumerated above. All the important naval actions of our several naval wars are adequately treated.

The authors have rightly given much weight to official reports, concerning which they make the following observations in their preface: "The fighter writes as he shoots—straight to the mark. He may be prejudiced in favor of his own flag, but his account is usually more sportsmanlike than are the corresponding accounts of his countrymen who were not there to see, and has a unique interest that no rewriting ever attains." It is certainly true that a good deal of naval history evaporates in the process of paraphrasing a participant's account of a battle—the actual phrasing on the spot gives off a fine historical aroma. It is also true that the quoting of an author necessitates a mixing of styles and interferes with the unity of a composition. The gain, however, in most cases will much more than counterbalance the loss.

This book contains many illustrations, maps and diagrams, and presents a pleasing typographical appearance. Its list of authorities at the end shows a discriminating reading of many of the sources of naval history. The style is simple and unadorned—entirely devoid of the journalistic claptrap that mars some of the current naval writing, of that cheap extravagant phrasing by means of which showy writers hope to seduce jaded intellects into reading inaccurate history. The volume ends with an index, which seems to be well made.

C. O. PAULLIN.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan. U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

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THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A Proposed Uniform Course of Instruction for the Naval Militia. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

Torpedoes in Exercise and Battle. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

Our Naval Power. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

Target Practice and the Training of Gun Captains. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

The Automobile Torpedo and its Uses. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A Naval Training Policy and System. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

Systematic Training of the Enlisted Personnel of the Navy. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

Our Torpedo-Boat Flotilla. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904.

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A Plea for a Higher Physical, Moral and Intellectual Standard of the Personnel for the Navy. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

The Department of the Navy. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907.

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908.

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909.

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910.

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911.

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-eighth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute. by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio,* an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly and anyone may subscribe for them. The annual subscription is $3.00; single copies, 75 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1912.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1912. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

W. B. WELLS,
Lieut.-Commander, U. S. N., Secretary and Treasurer.